v.15-16

Vol. 15 No. 1 JANUARY, 1961

BRITISH JOURNAL OF PREVENTIVE & SOCIAL MEDICINE

THE UNIVERSITY OF MICHIGAN
MAY 9 1961
PUBLIC HEALTH LIBRARY

EDITED BY
A. L. COCHRANE, JOHN KNOWELDEN, AND ALICE STEWART

WITH THE ASSISTANCE OF

W MELVILLE ARNOTT
F. A. E. CREW
A. BRADFORD HILL
LANCELOT HOGBEN
W. J. E. JESSOP
SIR AUBREY LEWIS
W P. D. LOGAN
THOMAS MCKEOWN
J. N. MORRIS
J. A. FRASER ROBERTS
IAN TAYLOR

RICHARD DOLL
A. MAIR
JOHN PEMBERTON
} representing the SOCIETY FOR SOCIAL MEDICINE

and the EDITOR of the *British Medical Journal*

CONTENTS

PAGE

Pulmonary Ventilatory Functions of Coalminers in Various Areas in Relation to the X-ray Category of Pneumoconiosis. A. L. COCHRANE and I. T. T. HIGGINS with the assistance of JACOB THOMAS 1

Theory and Observation in Family Epidemics of the Common Cold. M. A. HEASMAN and D. D. REID.. 12

Social Class and Prognosis in Schizophrenia. Part I. B. COOPER 17

Social Class and Prognosis in Schizophrenia. Part II. B. COOPER 31

Prostitution and Venereal Disease. Social Considerations of Prostitution. R. R. WILLCOX .. 42

LONDON
BRITISH MEDICAL ASSOCIATION
TAVISTOCK SQUARE, W.C.1

YEARLY SUBSCRIPTION (4 NUMBERS) £3 U.S.A. $10.00 SINGLE NUMBER 17s. 6d.

NOTICE TO CONTRIBUTORS

THE BRITISH JOURNAL OF PREVENTIVE AND SOCIAL MEDICINE is intended for the publication of original work in the field. Contributions in the English language from workers of any nationality may be considered for publication.

As understood by those who are responsible for this Journal, social medicine is that branch of science which is concerned with: (*a*) biological needs, interactions, disabilities, and potentialities of human beings living in social aggregates; (*b*) numerical, structural, and functional changes of human populations in their biological and medical aspects. To a large extent its methods must necessarily be statistical, involving the use of numerical data obtained either from official sources or from special field investigations, and interpreted in the light of established findings of the laboratory and of the clinic. Social medicine takes within its province the study of all environmental agencies, living and non-living, relevant to health and efficiency, also fertility and population genetics, norms and ranges of variation with respect to individual differences, and investigations directed to the assessment of a regimen of positive health.

All papers submitted for publication and all other editorial matters should be addressed to The Editors, BRITISH JOURNAL OF PREVENTIVE AND SOCIAL MEDICINE, c/o British Medical Association, Tavistock Square, London, W.C.1.

Papers are accepted on the understanding that they are subject to editorial revision, and that they are contributed to this Journal only. The Editors cannot undertake correspondence about papers returned as unsuitable on the advice of members of the Editorial Board.

Adequate reference should be made to previous work on the subject of the paper. A summary of observations and conclusions must be given.

Papers sent for publication must be typewritten on one side of the paper only, with double spacing and with a margin of at least 1¼ inches. Illustrations should be used sparingly. Photographs should be printed on glossy paper and should be a little larger than the size desired for reproduction. Drawings and diagrams should be done in black ink on tracing linen, Bristol board, or stout, white paper. Any lettering on these drawings should be lightly inserted in pencil. The setting up of type by the printers will be much facilitated if attention is paid to the proportions of the standard page measurements. The Editors express the hope that contributors will study the conventions of shading and design of charts employed in the Journal with a view to standardizing visual symbols for ready recognition.

References should be arranged alphabetically at the end of the paper according to the Harvard system. If the reference is to a book, the place of publication, the number of the edition, and the page number should be given. In the text the year of publication must follow the author's name, more than one paper in any one year being indicated by a small letter (a, b, c) after the date. The reference should be given as follows: author's name, initials, year of publication (in parentheses), title of periodical (in italics, abbreviated according to *World Medical Periodicals*), volume number (bold type arabic numerals), and first page number (ordinary type arabic numerals); book titles (in roman and inverted commas), followed by publisher, place of publication, etc.:

Engle, E. T., and Shelesnyak, M. C. (1934). *Hum. Biol.*, **6**, 431.
Fluhmann, C. F. (1936). *Amer. J. Obstet. Gynec.*, **31**, 573.
—— (1939). " Menstrual Disorders." W. B. Saunders, Philadelphia.
Gómez, F. D. (1942). *Hoja tisiol.*, **2**, 25.

Contributors will receive one proof, but it is assumed that all but verbal corrections will have been made in the original manuscript; an allowance at the rate of ten shillings per sheet of sixteen pages is made for alterations in the proof (printer's errors excepted), and contributors will be responsible for any excess.

Fifty reprints of papers will, if desired, be provided free. A limited number of additional reprints at cost price can be supplied if application is made when returning proofs. An estimate of the cost will be given on application to the Publishing Manager, British Medical Association.

The Journal will be published quarterly.

Papers which have appeared in THE BRITISH JOURNAL OF PREVENTIVE AND SOCIAL MEDICINE remain the property of the Journal, and permission to republish them must be obtained from the Editors.

Applications for advertisement space should be addressed to the Advertisement Manager, British Medical Association, Tavistock Square, London, W.C.1.

NOTICE TO SUBSCRIBERS

Subscriptions (£3 per annum) are payable to the British Medical Association.

Brit. J. prev. soc. Med. (1961), **15**, 1–11

PULMONARY VENTILATORY FUNCTIONS OF COALMINERS IN VARIOUS AREAS IN RELATION TO THE *X*-RAY CATEGORY OF PNEUMOCONIOSIS

BY

A. L. COCHRANE AND I. T. T. HIGGINS
WITH THE ASSISTANCE OF
JACOB THOMAS

From the Pneumoconiosis Research Unit, Llandough Hospital, Penarth, and the Department of Tuberculosis and Chest Diseases, Welsh National School of Medicine, Cardiff

Although medical opinion is in general agreed that progressive massive fibrosis can cause pulmonary disability, there is little evidence from unselected populations and there is considerable difference of opinion about simple pneumoconiosis. The early literature on the subject has been well summarized by Gilson and Hugh-Jones (1955), and Higgins, Oldham, Cochrane, and Gilson (1956), Carpenter, Cochrane, Gilson, and Higgins (1956), and Newell and Browne (1955) have added to our knowledge of the subject. In this paper we are attempting another review, based on the surveys already described by Carpenter and Higgins and their colleagues (1956) in the Rhondda Fach and Leigh, the survey at Staveley (Higgins, Cochrane, Gilson, and Wood, 1959), and a new survey carried out in the summer of 1958 in the Rhondda Fach (Higgins and Cochrane, 1961). In addition, for purposes of comparison, we make use of the two surveys carried out in agricultural areas (Higgins, 1957; Higgins and Cochran, 1958).

Materials and Methods

The areas have all been previously described, as have the populations examined. They all consist of random samples stratified by age, sex, and occupation, of the population enumerated by nominal census, living in a defined area. In the present paper we are concerned only with those members of the population who were "pure" miners, *i.e.* those who had been coalminers and had not been exposed to any other industrial risk likely to produce pneumoconiosis or pulmonary disability. For this reason the number of miners in the Leigh population are smaller than those previously published (Higgins and others, 1956).

For all the surveys the following information has been available:

(1) A detailed industrial history.

(2) A measurement of the indirect maximum breathing capacity (I.M.B.C.). (Forced expiratory volume/0·75 sec. $\times 40$.) (McKerrow, McDermott, and Gilson, 1960).

(3) Answers to a standardized questionnaire about respiratory symptoms and smoking habits (Higgins and others, 1956).

(4) Results of classifying standard postero-anterior chest films, using the International Classification (I.L.O., 1959).

(5) Anthropometry (stem height and weight).

We believe in general that the material obtained from the various surveys is entirely comparable. The refusal rates were all approximately the same (less than 10 per cent.). The anthropometry and the industrial histories have been taken by the same team; one of us (I.T.T.H.) asked all the questions in the questionnaire, except at Staveley where, for experimental purposes, one half of the population was randomly allocated to Dr. J. C. Gilson. The same *x*-ray van and radiographers have been with us throughout and the same standardized I.M.B.C. machine was used. Only a few possible sources of inter-area bias remain:

(1) The effect of the man in charge of the I.M.B.C. machine. This source of bias has been discussed by Higgins and others (1959).

(2) The effect of a secular trend in *x*-ray reading. This was quite likely as the *x*-ray reading covers a considerable period of years (1953–58). The point

was therefore investigated by one of us (A.L.C.), who re-read all the chest films involved after they had been masked to conceal date and place of origin and arranged in random order. The results (see Appendix) suggest that, although temporary biases may have appeared at particular times, no striking overall bias was apparent when all the results were pooled. The average I.M.B.C. results were, however, calculated for the old and the new *x*-ray results, but the "new" were found to differ minimally from the "old" values except in the age-*x*-ray groups which were very small indeed. These "new" readings, when referred to later, are called "randomized readings".

(3) The sampling technique at Leigh was rather different from the others and has been criticized (Gray, 1956). but we do not believe that any serious bias has been introduced (Oldham, 1956).

(4) The industrial history-taking at Leigh was not done by the same people as in the other surveys, and it is possible that comparability is not exact but the error should be small.

(5) In Staveley and Leigh an appreciable number of miners and ex-miners had to be excluded in order to obtain a population of pure miners and ex-miners, whereas in the Rhondda there are so few alternative outside occupations that the number excluded was negligible. It is clearly possible that the exclusion of these men with other dust exposures might have introduced bias. However, Higgins and others (1959) have shown that the addition of the group with a mixed industrial history alters the I.M.B.C. very little, and their retention in the population would lead to even greater difficulties of interpretation. It seems reasonably certain that this type of exclusion has not produced the regional differences by artefact.

This series of comparisons is confined to men aged 55 to 64 years. We have selected this age group as the best compromise between maximal exposure to occupational environment, and minimal bias due to early death.

Results

(*a*) Simple Pneumoconiosis

The questions that we can reasonably hope to answer are:

(1) Is there any relationship between *x*-ray category of simple pneumoconiosis and disability?

(2) Are those without pneumoconiosis more or less disabled than those with simple pneumoconiosis?

(3) Are there any regional differences? If so, what are the reasons for them?

(4) If we exclude the effects of progressive massive fibrosis (P.M.F.), are miners and ex-miners more disabled than they would have been had they never gone into mining?

Table I and Fig. 1 (opposite) give the basic figures relevant to the first two questions. The differences between the totals of the "old" and "randomized" populations (if anyone cares to add them up) are due to the differences in the number read as suffering from P.M.F. on the two occasions. There is clearly very little evidence of any trend of increasing disability with increasing category except at Leigh (old), and the Rhondda Fach, 1954 (2) (old), where the numbers are small and the trend is reversed in the randomized

TABLE I

AVERAGE INDIRECT MAXIMUM BREATHING CAPACITIES OF MINERS AND EX-MINERS AGED 55–64, IN THE THREE AREAS WITHOUT P.M.F., BY CATEGORY OF SIMPLE PNEUMOCONIOSIS

Area	Type of Categorization	Category of Simple Pneumoconiosis										
		0		1		2		3		Total 1, 2, 3		Total 0, 1, 2, 3
		Average I.M.B.C.	No.	Average I.M.B.C.	No.	Average I.M.B.C.	No.	Average I.M.B.C.	No.	Average I.M.B.C.	No.	No. of Cases
Rhondda Fach, 1954 (1) ..	Old ..	68·5	47	—	—	—	—	77·1	46	—	—	—
Rhondda Fach, 1954 (2) ..	Old ..	75·1	19	89·9	9	65·3	7	40·0	1	76·8	17	36
	Randomized	79·2	20	68·4	7	70·9	8	—	—	69·7	15	35
Rhondda Fach, 1958 (3) ..	Old ..	77·1	25	72·4	24	82·1	15	92·0	1	76·5	40	65
	Randomized	79·2	27	71·4	18	79·8	19	79·4	7	76·3	44	71
Leigh, 1954 ..	Old ..	76·6	64	91·2	5	84·5	6	81·3	6	85·4	17	81
	Randomized	77·0	49	71·1	17	85·8	6	94·5	8	80·0	31	80
Staveley, 1957	Old ..	86·8	96	82·9	27	93·6	22	82·5	4	87·3	53	149
	Randomized	86·2	107	92·9	19	90·3	14	92·0	5	91·8	38	145
Total	Old ..											331
	Randomized											331

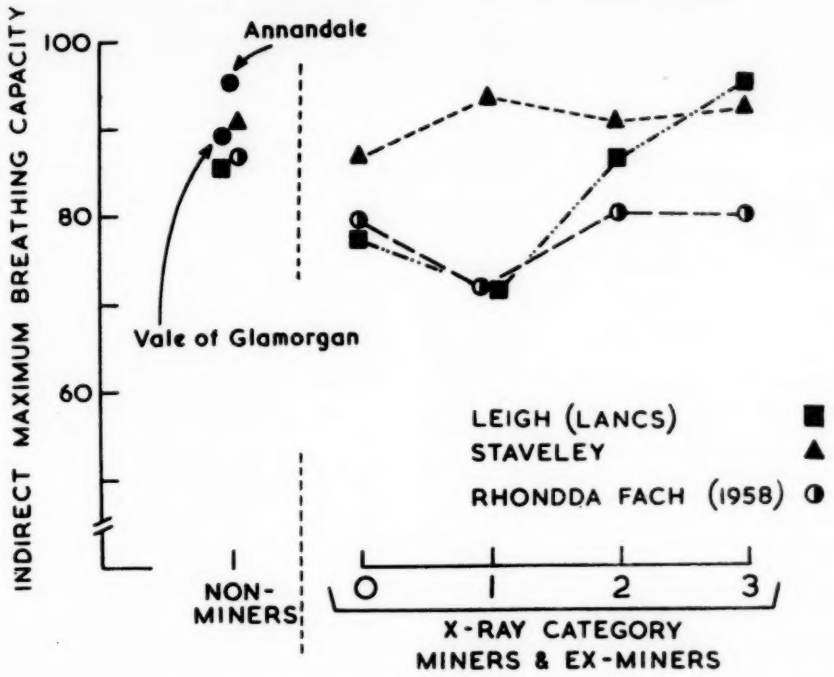

FIG. 1.—The relationship between the average indirect maximum breathing capacity and the *x*-ray category of pneumoconiosis in random samples of males aged 55–64 in various areas.

series. It must, however, be remembered that there is an alternative explanation. Pneumoconiosis is mainly a condition of face workers, and selective factors affect both the taking up of face work and the length of time men stay on the coal face. It seems possible that only the fittest people survive on the coal face long enough to reach Category 3. It may therefore be that although the average ventilatory capacities of the various categories are the same, the loss of potential ventilatory capacity may be greater in those with the higher categories.

The problem of whether those with or without pneumoconiosis were the more disabled is best assessed by comparing the first and last columns in Table I. In our first Rhondda surveys and at Leigh we found that those without pneumoconiosis were the more disabled (Carpenter and others, 1956). In Staveley this effect was scarcely present, and when we repeated the survey in the Rhondda in 1958 we again were unable to show this effect in the same age group and the same population as that in which we demonstrated it before. We have some difficulty in explaining the findings. One possible explanation is that the difference was due to the time of year when the surveys were carried out—the first survey was done in early spring and the second in summer. On the whole, there is little to support this. Another possible explanation is that in the first survey we happened to be studying different though overlapping cohorts, one of which had been particularly severely affected by illness or migration in the early part of their lives. The difference in the average values of the I.M.B.Cs of those in Category 0 in 1954 (1) and 1958 (3) does not quite reach statistical significance at the 5 per cent. level, and can perhaps be explained by the inevitable sampling error. For the moment all we can say is that the evidence for any decrease in ventilatory function, specifically industrial in origin, amongst those without pneumoconiosis is not as strong as we had previously considered it to be.

The next question concerns the differences between the areas (Table II, overleaf). There is no significant difference between the areas in the average values of the I.M.B.C. for those not exposed to dust, except between Annandale and Leigh ($0{\cdot}05 < P < 0{\cdot}03$).

TABLE II

AVERAGE INDIRECT MAXIMUM BREATHING CAPACITIES OF MEN AGED 55-64, IN AGRICULTURAL AREAS AND OF THOSE NOT EXPOSED TO DUST, AND OF MINERS AND EX-MINERS WITHOUT PROGRESSIVE MASSIVE FIBROSIS IN THE THREE AREAS (RANDOMIZED READINGS)

Area	Not Exposed to Dust	Pure Miners and Ex-miners
Annandale	94·8 (91)	
Vale of Glamorgan..	89·0 (86)	
Rhondda Fach, 1958..	86·6 (85)	77·4 (71)
Leigh, Lancs.	84·9 (49)	78·2 (80)
Staveley	90·1 (81)	87·7 (145)

( ) Number in group.

This is possibly due to the atmospheric pollution for which Leigh is well known. Amongst the miners and ex-miners, the values for Leigh and the Rhondda Fach are significantly lower than those for Staveley ($P<0·01$), but they are not significantly different from each other. When the miners and ex-miners are compared with the non-miners in the same area, the only significant difference is found in the Rhondda Fach ($0·01<P<0·02$). A further point is worth making here. We referred earlier to some possible inter-area biases which we had attempted to avoid. In the case of the comparison between Staveley and the 1958 Rhondda Fach survey, it is possible to exclude bias as far as is humanly possible. Both surveys were carried out at the same time of year, and the physiological tests were carried out entirely by one of us (I.T.T.H.) in the Rhondda Fach in 1958, and the same man also carried out the tests on half (a randomized half) of the population examined at Staveley, so if we use in addition the randomized *x*-ray readings there appears to be no possibility of bias. The results are shown in Table III and the difference between Staveley and the Rhondda miners and ex-miners is significant ($P<0·01$).

TABLE III

COMPARISON BETWEEN THOSE MEN SEEN BY I.T.T.H. AT STAVELEY AND IN THE RHONDDA, AGED 55-64 IN 1958, USING THE RANDOMIZED X-RAY READINGS

Area	Average I.M.B.C.					
	Not Exposed to Dust	X-Ray Category of Pure Miners and Ex-Miners				
		0	1	2	3	Total
Rhondda Fach,.. 1958 .. .	86·6 (85)	79·2 (27)	71·4 (18)	79·8 (19)	79·4 (7)	77·4 (71)
Staveley	88·6 (42)	86·5 (51)	96·7 (10)	92·9 (7)	104·0 (1)	88·8 (69)

( ) Number in group.

The existence of such regional differences is surprising, and it is clear that we must approach the problem of possible explanations rather cautiously. The areas differ in very many ways, and the main problem will be to decide which, if any, of these differences is significant and relevant.

Considering first the anthropometric differences (summarized in Table IV), there are variations in both stem height and weight between the different areas.

TABLE IV

MEASUREMENTS OF STEM HEIGHT AND WEIGHT OF MINERS AND EX-MINERS AGED 55-64 WITHOUT PROGRESSIVE MASSIVE FIBROSIS IN THE THREE AREAS BY CATEGORY OF SIMPLE PNEUMOCONIOSIS (RANDOMIZED READINGS)

Area	Stem Height (in.)		Weight (lb.)	
	Category 0	Categories 1, 2, 3	Category 0	Categories 1, 2, 3
Rhondda Fach,.. 1958	34·4 (27)	34·2 (44)	144·9 (27)	137·4 (44)
Leigh, Lancs. ..	34·2 (49)	34·0 (31)	152·1 (49)	144·5 (31)
Staveley	35·7 (107)	34·7 (38)	152·7 (107)	152·4 (38)

The former, however, is small and is unlikely to account for the difference (1 in. of stem height = 6·8 litres per minute I.M.B.C.: Carpenter and others, 1956). The differences in weight are more striking but are operating in the wrong direction (Gilson and Hugh-Jones, 1955). A possible explanation is the higher prevalence of bronchitis in the Rhondda Fach compared with the other areas. Table V (opposite) gives a comparison of the smoking habits of the same groups. The percentage of non-smokers is somewhat higher at Staveley but the percentage of heavy smokers is also higher there.

Table VI (opposite) summarizes the differences as regards the prevalence of pneumoconiosis, together with the average time spent by the miners and ex-miners at the coal face and underground. The prevalence of pneumoconiosis is very much higher in the Rhondda than in Leigh, and in Leigh than in Staveley. This in itself is probably unimportant from our present point of view, as our results have been standardized for *x*-ray category, but the higher prevalence of P.M.F. in the Rhondda and Leigh may be important. If P.M.F. tends to develop in miners who before onset have a high I.M.B.C., the exclusion of these men would decrease the average I.M.B.C. of the remainder, *i.e.* areas with a high prevalence of P.M.F. (*e.g.* the Rhondda), would have low average I.M.B.C. among those with simple pneumoconiosis. This

TABLE V

SMOKING HABITS OF MINERS AND EX-MINERS AGED 55–64 IN THE THREE AREAS, WITHOUT PROGRESSIVE MASSIVE FIBROSIS (USING RANDOMIZED READINGS)

Area	Smoking Habits	Non-Smokers	Cigarettes (per day)				Ex Smokers	Total
			1–4	5–14	15–24	25+		
Rhondda Fach	No.	2	4	41	12	2	10	71
	Per cent.	2·8	5·6	57·7	16·9	2·8	14·1	99·9
Staveley	No.	19	11	52	38	10	15	145
	Per cent.	13·1	7·6	35·9	26·2	6·9	10·3	100·0
Leigh	No.	3	2	41	20	7	7	80
	Per cent.	3·8	2·5	51·3	25·0	8·8	8·8	100·2

TABLE VI

VARIOUS CHARACTERISTICS OF THE MINERS AND EX-MINERS, AGED 55–64, IN THE THREE AREAS (RANDOMIZED READINGS)

Area	No. of Miners	Simple Pneumoconiosis		Progressive Massive Fibrosis		Average No. of Years at Coal Face
		No.	Per cent.	No.	Per cent.	
Rhondda Fach, 1958	92	44	47·8	21	22·8	12·0
Leigh, Lancs. ..	85	31	36·5	5	5·9	12·6
Staveley ..	145	38	26·2	0	0	12·5

TABLE VII

THE RELATIONSHIP BETWEEN X-RAY CATEGORY OF PNEUMOCONIOSIS AND THE AVERAGE NUMBER OF YEARS SPENT ON THE COAL FACE AMONGST MINERS AND EX-MINERS IN THE THREE AREAS (RANDOMIZED READINGS)

Category	Rhondda Fach		Leigh		Staveley	
	No. of Miners	Average Years at Coal Face	No. of Miners	Average Years at Coal Face	No. of Miners	Average Years at Coal Face
0	27	7·0	49	10·1	107	10·0
1	18	10·9	17	10·8	19	18·5
2	19	13·3	6	13·7	14	19·1
All Category 2 including P.M.F.	26	13·2	9	21·0	—	—
3	7	15·8	8	25·5	5	25·2
All Category 3 including P.M.F. and U.R.	21	18·7	10	21·0	—	—
Total ..	92		85		145	

explanation of the regional differences in disability seems improbable, and is contradicted by the observation that the average I.M.B.C. of those with the earliest signs of P.M.F. in this age group is identical with that of miners with simple pneumoconiosis. The regional differences in the prevalence of P.M.F. are of course interesting in themselves, but are hardly relevant here. They have been discussed by McCallum and Browne (1955).

The similarity in the average values for the time spent at the coal face is probably due to several factors balancing out, *e.g.* the fact that Welsh miners go on to the coal face earlier has been balanced by the greater unemployment in Wales. It does, however, suggest that the Rhondda Fach collieries may have been, on average, dustier than the others, or that the Staveley dust is less easily retained or less radio-opaque (Rivers, Wise, King, and Nagelschmidt, 1960). This point is brought out rather more clearly in Table VII, in which the average number of years at the coal face is related to the *x*-ray categories of simple pneumoconiosis. The values for Leigh are somewhat erratic (probably for the reasons already mentioned), but in general there seems to be a steady gradient from the Rhondda Fach to Staveley. If one then assumes that dust retention is related to the product of dust concentration and duration of exposure, one can hazard the suggestion that the average dust concentration on the coal faces in the Rhondda Fach has been on average about 50 per cent. higher than at Staveley.

Turning now to the problem of bronchitis. Throughout all these surveys the diagnosis of bronchitis has been based on the questionnaire (p. 2), and the same arbitrary level for diagnosis has been used, *i.e.* "persistent sputum and at least one bronchitic illness during the past 3 years" (Higgins and others, 1959). Table VIII (overleaf) shows the overall prevalence of bronchitis and the lack of obvious relationship between bronchitis and *x*-ray category, although the numbers are, of course, small. This is very possibly due to the fact that bronchitics may leave the coal face early before they have had time to progress to the higher categories, but we are unable to find any evidence here connecting bronchitis with dust retention. There are

TABLE VIII

PREVALENCE OF "BRONCHITIS" IN RELATION TO X-RAY CATEGORY OF SIMPLE PNEUMOCONIOSIS AMONGST MINERS AND EX-MINERS, AGED 55–64, IN THE THREE AREAS (EXCLUDING P.M.F.) (RANDOMIZED READINGS)

Area	X-ray Category of Simple Pneumoconiosis														
	0			1			2			3			Total		
	No. of Miners	Cases of Bronchitis	Per cent.	No. of Miners	Cases of Bronchitis	Per cent.	No. of Miners	Cases of Bronchitis	Per cent.	No. of Miners	Cases of Bronchitis	Per cent.	No. of Miners	Cases of Bronchitis	Per cent.
Rhonnda Fach, 1958	27	10	37·0	18	5	27·8	19	4	21·1	7	1	14·3	71	20	28·2
Leigh, Lancs ...	49	12	24·5	17	6	35·3	6	—	—	8	1	12·5	80	19	23·8
Staveley	107	23	21·5	19	1	5·3	14	3	21·4	5	3	60·0	145	30	20·7

other reasons for being cautious about blaming bronchitis for the regional differences. In a previous paper (Carpenter and others, 1956) we showed that when the bronchitics were excluded from the Rhondda and Leigh populations the differences remained. Similarly, exclusion of the Staveley bronchitics makes very little difference. The high prevalence of bronchitis amongst miners' wives in the Rhondda Fach (Higgins and Cochrane, 1961) also suggests that there are non-industrial causes for the high prevalence of bronchitis there.

Another approach to this problem is that suggested by Kadlec and Vyskocil (1950). They called attention to the fact that there was a relationship between ventilatory capacity and the number of years men had been exposed to dust. They found this effect chiefly in workers over 45, but in all *x*-ray category groups. Similar effects have been reported by Carstens, Brinkmann, Lange, Meisterernst, and Schlicht (1958) and by Worth, Valentin, Gasthaus, Hoffmann, and Venrath (1955). Table IX summarizes our results from this point of view. This effect appears somewhat irregularly in our material; considering all four categories (0, 1, 2, and 3), it is present and gradual at Staveley, but not apparent at Leigh, while in the Rhondda Fach there appears to be a marked drop after one year in mining, and thereafter a plateau. The effect is apparent to some degree in all the groups of Category 0, but not at Leigh or Staveley amongst groups of Category 1, 2, and 3. Possibly the extent to which we have confirmed the work of the other workers is better demonstrated in Table X.

TABLE X

RELATIONSHIP BETWEEN I.M.B.C. IN MEN AGED 55–64 IN THREE AREAS AND THE NUMBER OF YEARS SPENT ON THE COAL FACE (EXCLUDING CASES OF P.M.F.) (RANDOMIZED READINGS) (AS IN TABLE IX)

Area	Non-Miners	Miners and Ex-Miners		
		Number of Years on Coal-getting Shift		
		<1	<10	>10
Rhondda Fach,.. 1958	86·6	89·9	78·8	75·8
Leigh, Lancs. ..	84·9	79·9	80·8	75·7
Staveley	90·1	94·0	92·7	83·5

TABLE IX

RELATIONSHIP BETWEEN THE AVERAGE I.M.B.C. OF MINERS AND EX-MINERS, AGED 55–64, IN THREE AREAS AND THE NUMBER OF YEARS SPENT ON THE COALFACE (EXCLUDING CASES OF P.M.F.) (RANDOMIZED READINGS)

Area	Category	No. of Years on Coal-getting Shift								Total
		<1		1–9		10–19		20+		
		No. of Miners	Average I.M.B.C.	No. of Miners	Average I.M.B.C.	No. of Miners	Average I.M.B.C.	No. of Miners	Average I.M.B.C.	
Rhondda Fach, 1958	0	5	92·4	15	79·5	5	58·4	2	95·5	27
	1, 2, 3	4	86·8	14	70·9	16	82·8	10	69·3	44
	0, 1, 2, 3	9	89·9	29	75·4	21	77·0	12	73·7	71
Leigh, Lancs. ..	0	19	81·2	8	81·6	11	79·7	11	63·6	49
	1, 2, 3	10	77·5	1	102·0	8	83·1	12	78·2	31
	0, 1, 2, 3	29	79·9	9	83·9	19	81·2	23	71·2	80
Staveley ..	0	38	93·4	20	86·8	27	81·4	22	79·0	107
	1, 2, 3	2	105·5	5	106·4	12	89·2	19	88·2	38
	0, 1, 2, 3	40	94·0	25	90·7	39	83·8	41	83·2	145

TABLE XI

PREVALENCE OF "BRONCHITIS" IN RELATION TO YEARS SPENT ON THE COALFACE AMONGST MINERS AND EX-MINERS, AGED 55–64, IN THE THREE AREAS (EXCLUDING P.M.F.) (RANDOMIZED READINGS)

Area	Years at the Coal Face														
	1			1–9			10–12			20+			Total		
	No. of Miners	Cases of Bronchitis	Per cent.	No. of Miners	Cases of Bronchitis	Per cent.	No. of Miners	Cases of Bronchitis	Per cent.	No. of Miners	Cases of Bronchitis	Per cent.	No. of Miners	Cases of Bronchitis	Per cent.
Rhondda Fach, 1958	9	1	11·1	29	10	34·5	21	6	28·6	12	3	25·0	71	20	28·2
Leigh, Lancs. ..	29	7	24·1	9	2	22·2	19	5	26·3	23	5	21·7	80	19	23·8
Staveley ..	40	9	22·5	25	3	12·0	39	10	25·6	41	8	19·5	145	30	20·7

There are several reasons why our results should differ from those of Kadlec and Vyskocil (1950), Worth and others (1955), and Carstens and others (1958). In general our material is less selected but much smaller numerically, and Kadlec used a different index of pulmonary ventilation. It does, however, appear to be an important finding which merits further attention.

Table XI shows the relationship of bronchitis to years at the coal face, but unfortunately from the point of view of any simple hypothesis there is very little sign of any relationship, although here again self-selection may be concealing the effect.

Another possibility is that differences in atmospheric pollution may be important. Leigh is visually the most polluted area, then Staveley, and then the Rhondda. The actual measurements available (D.S.I.R., 1959) are open to the criticism that they are not made in positions designed to give a representative value for the area in question, but the values for "SO_2" support the visual ranking order. Atmospheric pollution is therefore unlikely to be the cause of the differences, though it is of course possible that we do not yet know which constituent of the atmosphere to measure.

Yet another possibility is differential emigration. If more people left one area than another and they were on the average healthier than those remaining, such differences might well occur. The crude figures for the changes in size of the three cohorts involved can be obtained more or less directly from the Registrar General's Census returns. This is to say the figures for Leigh were obtained directly; for the Rhondda Fach we have used the figures for the Rhondda Urban District (now the Rhondda Borough) which includes both the Rhondda Fawr and the Rhondda Fach. Staveley was more complicated as it was involved in the Local Authority reorganization in the 1930s, when Staveley Urban District was formed from the Parish of Staveley and most of the Parish of Duckmanton. For the period before the reorganization we have combined the males of these two parishes and applied to them the age distribution of Chesterfield Rural District. After the reorganization we have used the required male age group of Staveley Urban District plus the number of men estimated to be in that age group in the remains of the Parish of Duckmanton, calculated from applying the Chesterfield Rural District age distribution to the total males there. This method, though inelegant, seemed likely to achieve comparability with the others. The results are shown in Table XII, and in Fig. 2 (overleaf), in which the number in each population aged 15–24 in 1911 represents 100 per cent. and the number in the same cohort at subsequent censuses is expressed as a percentage of that in 1911. This is not, of course, a study of a true cohort, since the size of each age group represents the balance between emigration and death on the one hand and immigration on the other, as compared with the size of the previous age groups at the previous census.

TABLE XII

PERCENTAGE DECLINE IN SIZE OF COHORTS IN VARIOUS AREAS

Area	Subjects	Age of Cohort (yrs)				
		15–24	25–34	35–44	45–54	55–64
Staveley	No.	1,368	1,066	1,286	No Census	950
	Per cent.	100	77·9	94·0		69·4
England and Wales (thousands)	No.	3,158	2,621	2,512		2,028
	Per cent.	100	83·0	79·5		64·2
Leigh Borough	No.	4,417	3,610	3,112		2,451
	Per cent.	100	81·7	70·0		55·5
Rhondda Urban District	No.	16,104	12,764	9,781		6,721
	Per cent.	100	79·3	60·7		41·7
Census Year		1911	1921	1931	1941	1951

The figures demonstrate that there have been large differences between the three areas in the rate of decline of the cohort measured in this way, and

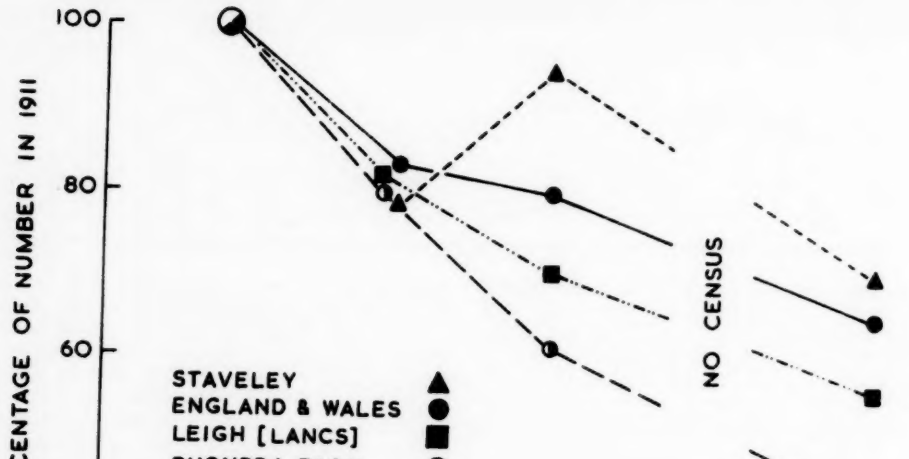

FIG. 2.—The percentage change in male "cohorts" (born 1887–1896) in three mining areas and in England and Wales.

further that the ranking of the areas is the same as that found in the surveys. This appears promising, but deficiencies in the data must be pointed out. These figures relate to all the males in that particular cohort and tell us nothing directly about the miners and ex-miners. In areas like the Rhondda the possible error is probably small because the miners and ex-miners represent such a high proportion of the male population, but in areas like Staveley where they represent under 50 per cent. in the 55 to 64 age group the possible error, when applying these figures to the mining community, may be large. It is, however, probable that in all three areas the figures are an under-estimate of the rate of decline of the mining cohort. In the late 1920s and 1930s unemployment was much higher in mining than in the lighter non-dusty industries and migration was probably higher too. In the case of the Rhondda Fach there is probably another factor causing the percentage of migrants to be an under-estimate. Local opinion is unanimous that a higher percentage of miners left the Rhondda Fach than the Rhondda Fawr, and although it is difficult to get quantitative evidence for this it seems reasonable to suggest that only

30 per cent. of the mining cohort remained in the Rhondda Fach compared with the 40 per cent. in the Rhondda Urban District. There has therefore been great scope for the various types of selection to have taken place.

Having established the probability of quantitative differences, the next step is to see whether the migration can have been selective from a qualitative point of view. Bradford Hill (1925) and Martin (1949) have already published work suggesting that migrants are healthier, taller, and heavier than non-migrants. There is also some unpublished evidence from the M.R.C.'s Obstetric Medicine Research Unit in Aberdeen suggesting that migrants are taller, have higher I.Q.s and, in the case of women, have a lower perinatal mortality rate (Illsley, 1960). We shall never discover how the migrants in the 1920s and 1930s from the Rhondda, Leigh, and Staveley differed from those they left behind. All we can do is to examine the situation at present, and some unpublished work is available at the Pneumoconiosis Research Unit, based on a follow-up of those *x*-rayed in 1950–51 (Cochrane, Cox, and Jarman, 1952); this strongly suggests that those who have left the valley since then were taller and heavier than those that remained. One should not, of course, imagine that all migrants were "up-and-coming go-getters". There were undoubtedly "drifters" as well. It is also probable that different types of migrant went to different areas. In the 1920s and 1930s the most vigorous tried their luck in London, Coventry, and Slough. The drifters probably moved to the same occupation in a neighbouring town. It seems clear that this, too, is a possible cause of the differences we have found, though its importance is hard to evaluate.

It is clearly impossible to be dogmatic about the causes of the regional differences. It is tempting to accept the evidence for a difference in dustiness at the coal face and assume this is the cause, but there is little evidence to connect bronchitis with dust retention, as seen in the *x*-ray, or to dust exposure. The effect described by Kadlec and Vyskocil (1950) may well be the key to the riddle, but as yet we know too little about it, while differential emigration may well have exaggerated the effects of the dust, if the bronchitics were less likely to migrate.

In discussing the regional differences we have assembled all the evidence available to help in deciding the final question whether miners and ex-miners would have had greater ventilatory capacities if they had never been coalminers. This is by far the most important question. It could be answered clearly by a long-term follow-up study of a male cohort which was randomly allocated, on leaving school, into coalmining and another occupation involving the same amount of hard work as coalmining for the same financial rewards. Both groups would stay in the same area in the same occupation throughout their working lives. Neither group would ever smoke. Clearly such a survey will never even be contemplated. The nearest to this that is practically possible and ethically desirable is a straightforward follow-up of school-leavers in mining areas, such as that started by Higgins and his colleagues (1956), but it will be many years before the results will be available. In the meantime, we must make the best possible use of cross-sectional studies as summarized in Table I, and the question resolves itself into deciding which of the three areas is least misleading.

Most people would agree that the Rhondda Fach, with its unique history of dusty mines and population loss, is likely to be unreliable. Similarly, one could argue that Staveley, with its odd history of immigration (Table XII), might give an over-optimistic picture. Three points can, however, be legitimately made against the latter view:

(1) The final figure for Staveley in 1951 is closer to the national average than Leigh.

(2) If it is argued that these Staveley miners would have had a higher average I.M.B.C. if they had not been exposed to coal dust, then we should find more evidence of the cause of the reduction in the form of respiratory symptoms. Higgins and others (1959), however, show that at Staveley the prevalence of respiratory symptoms amongst miners is little higher than amongst non-miners.

(3) If it is argued that the average I.M.B.C. of miners at Staveley is too high because of the influx of vigorous migrants, one can easily test the hypothesis by excluding the migrants. This actually causes the average I.M.B.C. to fall fractionally from 87·0 to 86·8.

(*b*) Progressive Massive Fibrosis

Owing to the general assumption that P.M.F. is a serious disease, there has understandably been more effort put into studying the disability of simple pneumoconiosis than that of P.M.F. No study of an entirely unselected sample has yet been published. The nearest approach was that of Gilson and Hugh-Jones (1955), who showed that as far as ventilatory capacity was concerned the early stage of P.M.F. was little different from that of simple pneumoconiosis. Other studies of P.M.F. as it occurred amongst working miners or amongst hospital patients are clearly unrepresentative.

We ourselves have only studied a few cases of P.M.F. where they occurred in random samples of

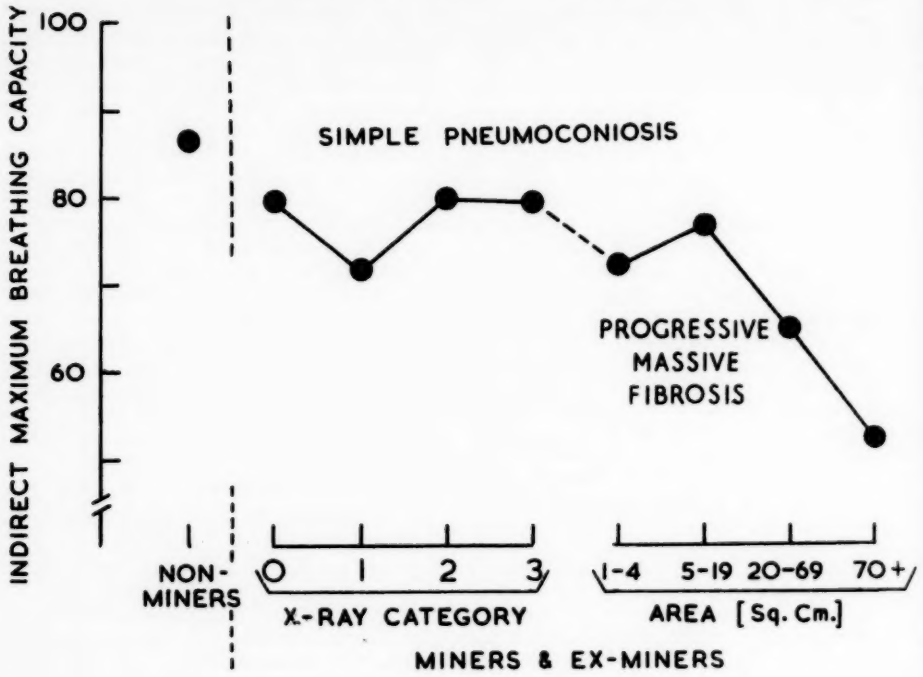

FIG. 3.—The relationship between the average indirect maximum breathing capacity and the *x*-ray category of pneumoconiosis in males aged 55–64 in the Rhondda Fach (random samples in 1958).

miners and ex-miners in the Rhondda Fach surveys of 1954 and 1958. The results are shown in Table XIII, and they are also shown diagrammatically in Fig. 3, together with the results of the 1958 survey for simple pneumoconiosis. The cases of P.M.F. have been classified according to the latest International Classification (International Labour Office, 1959), and also according to the area of the shadow.

TABLE XIII

AVERAGE VENTILATORY CAPACITIES OF MINERS AND EX-MINERS AGED 55–64 IN THE RHONDDA FACH WITH PROGRESSIVE MASSIVE FIBROSIS

Classification X-Ray Category	No. of Miners	Average Maximum Breathing Capacities	Classification Area (sq. cm.) of Shadow	No. of Miners	Average Maximum Breathing Capacities
A	20	74·0	1–4	4	72·3
B	10	66·8	5–19	19	76·7
C	10	61·3	20–69	10	64·8
Total	40	69·4	70+	7	52·4
			Total	40	69·4

The latter has been shown to be more sensitive as far as mortality is concerned than the former (Cochrane, Thomas, and Moore, 1961). The results show that the early stages of P.M.F. cause very little disability. Fig. 3 also shows what difficulties any selection hypothesis would have to face if one attempted to argue that the reduction in ventilatory capacity caused by pneumoconiosis was exactly balanced by the originally fitter men being self-selected to stay longer at the coal face, thus increasing their risk of developing pneumoconiosis.

CONCLUSIONS

Finally, the attempt must be made to answer the questions posed at the beginning.

(1) There appears to be no sound evidence at present to suggest an association of decreasing ventilatory function with increasing category of simple pneumoconiosis. It is still possible that some effect is concealed by selection, but it is unlikely.

The disabling effect of P.M.F. appears to be less than was previously thought. The disability does not seem to be appreciable until the area of the shadow on the radiograph exceeds 20 sq. cm.

(2) There appears to be less evidence than was previously thought for believing that those without pneumoconiosis are more disabled from the point of view of ventilatory function than those with simple pneumoconiosis.

(3) The existence of regional differences in the ventilatory function of miners and ex-miners seems to be established. There are probably several causes, among which the phenomena described by Kadlec and Vyskocil, bronchitis, and differential migration are probably important.

(4) There seems to be evidence for some decrease in ventilatory function in elderly miners, according to the length of time spent at the coal face. This effect appears to be unrelated to dust retention as seen in the radiograph, or to respiratory symptoms.

(5) The balance of the evidence is slightly in favour of elderly miners being slightly more disabled from the point of view of ventilatory function than they would have been if they had never become miners.

REFERENCES

Carpenter, R. G., Cochrane, A. L., Gilson, J. C., and Higgins, I. T. T. (1956). *Brit. J. industr. Med.*, **13**, 166.

Carstens, M., Brinkmann, O., Lange, H. J., Meisterernst, A., and Schlicht, H. (1958). *Arch. Gewerbepath. Gewerbehyg.*, **16**, 203.

Cochrane, A. L., Cox, J. G., and Jarman, T. F. (1952). *Brit. med. J.*, **2**, 843.

——, Thomas, J. T., and Moore, F. M. (1961). *Tubercle*, in the press.

Department of Scientific and Industrial Research (1959). "Investigation of Atmospheric Pollution". 30th Report. Research and Observations in the Year ended March 31st, 1957." H.M.S.O., London.

Gilson, J. C., and Hugh-Jones, P. (1955). *Med. Res. Coun. spec. Rep. Ser.*, No. 290.

Gray, P. G. (1956). *Brit. med. J.*, **2**, 1119.

Higgins, I. T. T. (1957). *Ibid.*, **2**, 1198.

——, and Cochran, J. B. (1958). *Tubercle*, **39**, 296.

——, and Cochrane, A. L. (1961). *Brit. J. industr. Med.*, **18**, in the press.

——, ——, Gilson, J. C., and Wood, C. H. (1959). *Ibid.*, **16**, 255.

——, Oldham, P. D., Cochrane, A. L., and Gilson, J. C. (1956). *Brit. med. J.*, **2**, 904.

Hill, A. Bradford (1925). *Med. Res. Coun. spec. Rep. Ser.* No. 95.

Illsley, R. (1960). Personal communication.

International Labour Office (1959). *Occup. Safety Hlth*, **9**, 63.

Kadlec, K., and Vyskocil, J. (1950). *Pravoc. Lék.*, **2**, 348.

Martin, W. J. (1949). *Med. Res. Coun. Memorandum*, No. 20.

McCallum, R. I., and Browne, R. C. (1955). *Brit. J. industr. Med.*, **12**, 279.

McKerrow, C. B., McDermott, M., and Gilson, J. C. (1960). *Lancet*, **1**, 149.

Newell, D. J., and Browne, R. C. (1955). *J. Fac. Radiol.*, **7**, 20.

Oldham, P. D. (1956). *Brit. med. J.*, **2**, 1241.

Rivers, D., Wise, M. E., King, E. J., and Nagelschmidt, G. (1960). *Brit. J. industr. Med.*, **17**, 87.

Worth, G., Valentin, H., Gasthaus, L., Hoffmann, H., and Venrath, H. (1955). *Arch. Gewerbepath. Gewerbehyg.*, **14**, 37.

APPENDIX

COMPARISON OF OLD AND NEW READINGS

		Old Reading					Total
		0	1	2	3	PMF	
New Reading	0	405	38	3	—	1	447
	1	43	45	19	—	2	109
	2	1	21	44	21	6	93
	3	—	—	9	100	10	119
	PMF	1	1	1	6	61	70
Total		450	105	76	127	80	838

Brit. J. prev. soc. Med. (1961), **15**, 12–16

THEORY AND OBSERVATION IN FAMILY EPIDEMICS OF THE COMMON COLD

BY

M. A. HEASMAN* AND D. D. REID

Department of Medical Statistics and Epidemiology, London School of Hygiene and Tropical Medicine

Recent developments in the mathematical theories of chance behaviour have quickened interest in their applications to epidemic experience. Theoretical epidemiology aims at the prediction of the likely flow of infection within a group given certain assumptions about the laws underlying epidemic events. Ross (1915), for example, deduced the rise and fall of malarial incidence which would derive from some basic axioms about the frequency of infective mosquitos biting susceptible hosts during their period of contact; Macdonald (1953) has brought this approach up to date by comparing field observations of malarial epidemics with expectation based on a mathematical model of the likely pattern of events. The practical importance of such work lies in the possibility of distinguishing those theories of epidemic behaviour which best fit the observed facts, in the hope that this will lead to a clearer understanding of the factors which determine that behaviour.

Most of the work in the field has dealt with major epidemics in large populations using "deterministic" models, *i.e.* when the future course of the epidemic is precisely determined by basic assumptions about the numbers of susceptibles and the frequency and intimacy of their contact with an infective source. In smaller groups, the likelihood of one susceptible making effective contact with an infectious member of the same group cannot be exactly predicted, for the element of chance bulks larger as the size of the group decreases. In these circumstances, this chance element has to be more carefully taken into account, and here the newer theories of stochastic behaviour have proved useful. Bailey (1957) gives a scholarly review of this development. It is enough to say that Greenwood (1931) introduced the idea that the spread of measles within a household could be described in terms of a series or chain of chance events which followed the usual binomial expression of the law of probability. Any one of three susceptible children exposed to an infection in another member of the family may, in general, have a 10 per cent. chance of getting the disease; but the number of times all would escape or one, two, or three be infected will follow the usual laws of chance represented by the expansion of the binomial $(\cdot 10 + \cdot 90)^3$. If only one is infected, the chance distribution of the frequency of the remaining children becoming infected in the next stage of the family epidemic is again represented by the binomial $(\cdot 10 + \cdot 90)^2$. In short, the pattern of a family epidemic follows the dictates of a chain of such binomials. Essentially the same line of argument had already been followed by Reed and Frost (Bailey, 1957) in developing their theory of the epidemic behaviour of measles in larger communities. But there was one important difference. Both theories assumed that the period of infectiousness was relatively brief, that the period of incubation was relatively long and constant in duration, and that the susceptibles, once infected, were effectively removed from circulation. In the Reed-Frost approach, however, the chance of infection among the remaining susceptibles at any particular stage of the epidemic depended on the number of infective subjects circulating at that stage, to which these susceptibles were exposed. Greenwood's model took no account of the possibility that this had any material effect. Lidwell and Somerville (1951) developed a model, algebraically identical to the Reed-Frost conception, which they applied to the results of their field study of colds in families in a village community. They found that their modification of Greenwood's chain binomial accorded better with their observations than did the original.

As Greenwood has remarked, mothers of large families need no refined statistical method to satisfy them that measles is an infectious disease; but the difficulty of producing evidence of infectiousness in less clearly defined maladies is evident in the inability of Hope Simpson and Sutherland (1954) to fit observation to epidemic theory in familial occurrences of

* Present address: General Register Office, Somerset House, W.C.2.

influenza. The need is for observational data of sufficient precision and detail to test the adequacy of the description of biological processes given by different epidemiological theories. An investigation of respiratory illnesses in families already reported (Brimblecombe, Cruickshank, Masters, Reid, and Stewart, 1958) produced the data discussed in the present paper.

Source and Nature of Material

In this investigation, families of the same size, two parents and three children, living in different circumstances of domestic overcrowding were visited at fortnightly intervals. The date of onset and the clinical nature of upper respiratory infectious experienced by each member of the family were charted on a time scale marked off in days. Family epidemics of acute coryza—or common colds—were thus available for analysis.

By inspection of the epidemic time charts, it was possible to identify new or primary introductions of illness into the household by the onset of a cold after a lapse of 10 days since the last such case in the same home. Two such cases occurring on the same or succeeding days were classified as multiple primaries. Thereafter, the links in the epidemic chain of spread were defined by an interval of one day or more between successive cases in the same family. These family epidemics could then be described thus — 1-2-1, 1-1-1-0, 2-1-0, etc. It must be emphasized that although this method of classification is somewhat arbitrary, it was completed before the corresponding theoretical distributions were worked out and the interval chosen agrees with the distribution of presumptive incubation periods of the common cold seen in field surveys (*e.g.* Badger, Dingle, Feller, Hodges, Jordan, and Rammelkamp, 1953).

Results

As already noted, the first stage of a family epidemic after a new single primary introduction should, in both the Greenwood and the Reed-Frost formulations, follow the simple binomial distribution of chance events. Table I compares the observed distribution of the number of the four susceptibles in these families then affected with the distribution expected on this purely random basis. The fit is excellent.

Table I

OBSERVED AND EXPECTED DISTRIBUTION OF COLDS IN THE FIRST STAGE OF FAMILY EPIDEMICS (SINGLE PRIMARY ONLY)

No. of Further Cases	No. of Families	
	Observed	Expected
0	423	420·91
1	199	203·18
2	39	36·79
3	3	3·05
4	0	0·07
Total	664	664·00

Probability of Transfer = 0·108
$\chi^2 = 0·205$; $d.f. = 1$; $0·70 > P > 0·50$

When this experience is broken down according to the family status of the introducing case, the fit of the observed to theoretical distribution of subsequent cases is obtained in Table II. The probabilities of transfer differ, of course, according to the status of the introducing or index case and the susceptibility of the remainder, and the significance of these differences have already been discussed (Brimblecombe and others, 1958). Although host susceptibility certainly differs between members of the family, these differences are not large enough to affect the fit of the total distribution seen in Table I.

Table II

OBSERVED AND EXPECTED DISTRIBUTIONS OF COLDS IN FIRST STAGE OF FAMILY EPIDEMICS ACCORDING TO THE STATUS OF THE INTRODUCING MEMBER (SINGLE PRIMARY ONLY)

No. of Further Cases	Status of Introducing Case							
	Father		Mother		School Child		Pre-school Child	
	Observed	Expected	Observed	Expected	Observed	Expected	Observed	Expected
0	53	55·0	75	73·4	148	144·3	147	149·2
1	31	27·4	25	27·5	77	84·3	66	62·3
2	4	5·1	4	3·8	22	18·6	9	9·7
3	0	0·4	1	0·2	2	1·8	0	0·7
4	0	0·0	0	0·0	0	0·1	0	0·0
Total	88	87·9	105	104·9	249	249·1	222	221·9
Probability of Transfer	·111		·086		·128		·095	
χ^2	1·18		3·47		1·47		1·00	
P	·80>·70		·50>·30		·70>·50		·90>·80	

Table III shows distribution of the total size (*i.e.* the number of susceptibles attacked) of those family epidemics actually observed compared with the total size to be expected, either on Greenwood's theory which ignores the added risk to susceptibles exposed to more than one infectious case, or on the Reed-Frost model which makes an allowance for this possibility. Clearly, the Reed-Frost theory is in better accord with the observed facts; but neither gives a very satisfactory prediction of the distribution of total epidemic size. When, however, the comparison of observation with expectation on the basis of the Reed-Frost model is made within groups of families living in similar housing conditions, the fit, seen in Table IV, is considerably improved by thus accounting for one source of variation.

TABLE III

OBSERVED AND EXPECTED DISTRIBUTIONS OF COLDS IN COMPLETED FAMILY EPIDEMICS (SINGLE PRIMARY ONLY)

No. of Further Cases	No. of Families		
	Observed	Expected	
		Reed and Frost	Greenwood
0	423	409·9	405·3
1	131	146·3	147·1
2	60	68·9	79·3
3	36	24·4	31·0 }
4	14	14·4	· 1·2 }
Total ..	664	663·9	663·9
		$\chi^2 = 8·69$ $n = 3$ $·05 > P > ·02$	$\chi^2 = 17·07$ $n = 2$ $P = < ·001$

TABLE IV

OBSERVED AND EXPECTED DISTRIBUTION ON THE REED-FROST MODEL ACCORDING TO DEGREES OF OVERCROWDING

Further Cases	Domestic Overcrowding					
	Overcrowding		Crowded		Uncrowded	
	Observed	Expected	Observed	Expected	Observed	Expected
0	112	106·8	155	145·7	156	158·1
1	35	40·5	41	53·6	55	51·6
2	17	20·7	24	26·3	19	21·8
3	11	8·3	15	9·9	10	6·4
4	6	4·6	6	5·4	2	4·1
Total ..	181	180·9	241	240·9	242	242·0
	$\chi^2 = 2·97$ $n = 3$ $·70 > P > ·50$		$\chi^2 = 6·45$ $n = 3$ $·10 > P > ·05$		$\chi^2 = 3·71$ $n = 3$ $·30 > P > ·20$	
Probability of Transfer ..	·124		·118		·101	

In Table V the family epidemics are classified into chains of different types, which include multiple as well as single primary cases. The observed frequencies agree well with the expectation based on the Reed-Frost model. For the single primary chains, the probability of infection is calculated from all the generations of the epidemic in contrast to the probability used in Table I, which is derived from first generation cases only. The probability of infection calculated in the double primary chains is derived in the same way from all generations, but it is assumed that secondary cases are infected by only one source. Thus, in the first generation, half of the cases occurring are attributed to one primary and half to the other. In estimating the probability of transfer between any two members of the family, the number of cases resulting from exposure to two sources of infection in the previous generation is therefore reduced by half. Calculated in this way, the probability of transfer during double primary epidemics is seen in Table V to be less than in outbreaks following a single introduction. This may be due to the simultaneous infection of two of the more susceptible members of the family at some common source such as the school, and a corresponding reduction in the transfer rate among the remaining more resistant members. Alternatively, the erroneous classification of an early secondary as a primary will lower the apparent risk of infection among the others in the household. The good fit between observed and theoretical values makes the latter possibility seem unlikely.

TABLE V

OBSERVED AND EXPECTED FREQUENCIES OF SINGLE OUTBREAKS ACCORDING TO REED-FROST MODEL

Chain	Observed	Expected	Chain	Observed	Expected
1–0	423	409·9	2–0	55	55·5
1–1–0	131	146·2	2–1–0	27	25·8
1–2–0	24	24·8	2–2–0	3	4·7
1–1–1–0	36	44·2	2–1–1–0	5	4·2
1–3–0	3	2·3	2–3–0	—	0·4
1–1–2–0	8	5·6	2–2–1	—	0·9
1–2–1–0	11	6·8	2–1–2	1	0·2
1–1–1–1–0	14	10·1	2–1–1–1	1	0·4
1–4	0	0·1			
1–3–1	0	1·1			
1–1–3	2	0·4			
1–2–2	1	1·9			
1–2–1–1	3	6·8			
1–1–2–1	2	1·6			
1–1–1–2	2	0·9			
1–1–1–1–1	4	1·5			
	664	664·2		92	92·1

Probability of transfer between any two specified members of group for
single primary = ·114
double primary = ·081

χ^2 (grouping up single and multiple primary outbreaks where expectations are less than 5) = 12·72
$n = 10$, $·30 > P > ·20$

Both the theoretical models used thus far have postulated a short period of infectiousness relative to a fairly constant incubation period. One of these

theories, which also took into account the number of infective sources present, has been shown to agree well with several aspects of the observational data. Observation is thus consistent with this hypothesis, but it gives no final proof, for the same data might be as well fitted by some alternative theory. Bailey (1955), for example, has evolved a model based on the original conception of M'Kendrick (1926) of a constant ratio of the rate of infection to the rate of removal of susceptibles from circulation by death, isolation, or recovery. Here, the period of infectiousness is not relatively instantaneous but has a distribution like the die-away negative exponential seen *e.g.* in counts of organisms in throat swabs from patients convalescing from diphtheria.

As Table VI shows, this model gives a very good fit to the total number of colds observed in completed family epidemics after a single primary. Indeed, the fit is better than predictions based on the Reed-Frost theory. Bailey himself found his model more appropriate to data collected in outbreaks of scarlet fever, where the period of infectiousness is relatively long, than to data from measles epidemics where the duration of infectiousness is very brief compared with the incubation period. In the common cold, therefore, it appears that, although the simpler theoretical model of chance contact between briefly infective individuals gives an adequate description of the pattern of spread, a more refined theory based on a prolonged period of infectivity of varying length and a consequent variable incubation period agrees better with at least one aspect of the observations.

TABLE VI

OBSERVED AND EXPECTED DISTRIBUTIONS OF SIZE OF COMPLETED FAMILY EPIDEMICS (BAILEY MODEL)

No. of Cases	Degree of Domestic Overcrowding					
	Overcrowded		Crowded		Uncrowded	
	Observed	Expected	Observed	Expected	Observed	Expected
0	112	113·5	155	154·2	156	166·3
1	35	32·3	41	42·9	55	42·1
2	17	18·1	24	23·3	19	19·9
3	11	11·5	15	14·0	10	10·0
4	6	5·7	6	6·6	2	3·7
Total ..	181	181·1	241	241·0	242	242·0
χ^2	0·35		0·24		5·41	
P	·95 > ·90		·98 > ·95		·20 > ·10	

In the discussion following the paper by Bailey (1955), Armitage suggested that a simultaneous variation in the chance of the transfer of infection between individuals and between families living in different circumstances might act in opposite directions to produce a spuriously good fit to a mathematical model which had not taken these factors into account. Table II has already shown that the individuals do vary in this respect, and Table IV confirms that environmental overcrowding also affects the risks of cross infection. Within each housing group, however, there is a reasonably close agreement between theoretical expectation based on the Reed-Frost model and actual observation.

When the Bailey continuous infection model is applied to the same housing groups, there is a disconcertingly good fit to the epidemics in the families living in overcrowded homes with either one or two rooms, or in crowded houses with three rooms. On the other hand, the fit for those living in uncrowded conditions was hardly as good as that for the brief infection period model. Without further tests of the appropriateness of each model, *e.g.* in the description of the epidemic chains as well as in the estimation of total epidemic size, it is impossible to be sure that the continuous infection model does give a better description of the epidemic pattern in a crowded household where bed isolation of the infective case is less easy; and, so far, no theory of the latter type has been suggested which can be applied to the description of epidemic chaining. Nor can it be said that the instaneous infection model is more appropriate to the conditions in larger and less crowded houses where effective exposure times are likely to be relatively short. Nevertheless, the application of such different models to observed facts illustrates the prospect of their use in deciding the most likely mechanism of epidemic behaviour in different environmental circumstances.

SUMMARY AND CONCLUSIONS

Time charts of outbreaks of the common cold in families living in different circumstances of domestic crowding have been used to test several theoretical models of epidemic behaviour. All these models have been designed to take into account the large element of chance in the risk of effective contact between infectious case and susceptible in small family groups.

In the first generation of family outbreaks, the simplest binomial laws of chance behaviour apply quite closely to the observed distribution of numbers of cases in this secondary wave.

Epidemic theories such as that proposed by Greenwood, which assume a brief period of infectiousness followed by a relatively long and stable incubation period, do appear to fit the observed distribution of the total numbers affected in a series of family outbreaks. A better fit is given by the Reed-Frost theory,

which also postulates an increased risk of infection when more than one infectious case is circulating in the home. The fit of this latter model is further improved when it is applied within groups of outbreaks where either the status of the introducing case or the degree of domestic overcrowding is the same.

When outbreaks are grouped according to the pattern of the serial occurrence of cases, there is close agreement between observation and expectation based on the Reed-Frost theoretical model. On the other hand, an alternative theory, developed by Bailey and based on the mixing of continuously infective sources with a group of susceptibles among whom the incubation period varies, gives a very close fit particularly to data from outbreaks in crowded homes. Unfortunately, no corresponding stochastic theory is yet available for the prediction of the time sequence of cases within the epidemic.

It appears that these theoretical models of epidemic behaviour are by no means unrealistic and that they hold out prospects of fruitful application in the interpretation of data collected by field inquiry. There is a clear need for the collection of such data and for the development of alternative theories of the mechanics of epidemic behaviour for testing against the observed facts.

This study was begun during the tenure of a Medical Research Council Grant by one of us (M.A.H.). We are grateful to Dr. Norman Bailey and Dr. Ian Sutherland for their criticisms and suggestions, and to Miss Linda Colwell and Mrs. Barbara Hunt for computing assistance.

REFERENCES

Badger, G. F., Dingle, J. H., Feller, A. E., Hodges, R. G., Jordan, W. S., and Rammelkamp, C. H. (1953). *Amer. J. Hyg.*, **58,** 174.

Bailey, N. T. J. (1955). *J. roy. statist. Soc., B,* **17,** 35.

—— (1957). "The Mathematical Theory of Epidemics." Griffin, London.

Brimblecombe, F. S. W., Cruickshank, R., Masters, P. L., Reid, D. D., and Stewart, G. T. (1958). *Brit. med. J.*, **1,** 119.

Greenwood, M. (1931). *J. Hyg. (Camb.),* **31,** 336.

Hope Simpson, R. E., and Sutherland, I. (1954). *Lancet,* **1,** 721.

Lidwell, O. M., and Sommerville, T. (1951). *J. Hyg. (Camb.),* **49,** 365.

MacDonald, G. (1953). *Trop. Dis. Bull.*, **50,** 871.

M'Kendrick, A. G. (1926). *Proc. Edinb. math. Soc.*, **44,** 98.

Ross, R. (1915). *Brit. med. J.*, **1,** 546.

Brit. J. prev. soc. Med. (1961), **15**, 17–30

SOCIAL CLASS AND PROGNOSIS IN SCHIZOPHRENIA. PART I

BY

B. COOPER

Glenside and Barrow Hospitals, Bristol

Three main theories have been advanced to explain the social class gradient in schizophrenia:

(1) That persons who develop schizophrenic illness have suffered from some pre-psychotic abnormality or inadequacy of personality which has resulted in their taking progressively less responsible and remunerative jobs and so sinking in the social scale before the onset of frank psychotic symptoms.

(2) That advanced by Hollingshead and Redlich (1958) that the findings are due to the less prompt and adequate treatment and rehabilitation of patients from the lower social groups.

(3) That persons in the lower social groups are subjected to greater social and economic stress, and that this stress is causally related to schizophrenic illness.

If the "drift" theory as originally postulated is correct, one would expect a number of concomitant findings. First, schizophrenic patients would be found to have descended the social scale before the onset of their psychosis, to be more "socially mobile" than average. Secondly, associated with this, they would be geographically more mobile, tending to move residence and place of work periodically in their downward drift. Thirdly, if the individual's social decline is due to his own inadequacy rather than to external factors, one would expect to find the social class level of any large group of schizophrenic patients lower than that of their parents.

Hollingshead and Redlich found that the patients of lower social class in their investigation were not more "geographically transient" than the others; indeed, a higher percentage of their Class V cases than of their Class I and II cases had been life-long residents of the community. Furthermore, most of the Class I and II patients had lived in the better residential areas, and most of the Class V patients in the slum areas, all their lives. They concluded that there was no significant evidence of a drift to the slums with the onset of schizophrenia.

Similarly, Lapouse, Monk, and Terris (1956), from a survey of 587 schizophrenic patients in New York, concluded that their concentration in low economic areas was not the result of downward drift, nor of recent migration into these areas of socially mobile men living alone.

On the other hand, work in progress in Great Britain (Morrison, 1959) suggests that there is a random social class distribution among the fathers of male schizophrenic patients, despite the excess of lower social class individuals among these patients. Morrison and his colleagues believe that, while there is no individual downward drift in schizophrenia, there may be a downward drift from one generation to another, due to genetic factors and to environmental influences operating in childhood, such as broken homes and maternal deprivation. These results, if verified, contradict those of Hollingshead and Redlich; whether they represent a real difference in incidence between Great Britain and the United States is not clear. Harris, Linker, Norris, and Shepherd (1956) found a significant fall in social class in one generation only for patients whose fathers were in Social Class I or II.

The second theory suggests that the incidence of schizophrenia is not in fact higher in the lower social grades, but that persons in these grades who develop a schizophrenic illness are less likely to have prompt and effective treatment; in consequence they do not make so good or permanent a recovery, and are more likely to go on to develop a chronic illness, thus producing a higher prevalence of schizophrenia among the lower social grades.

Hollingshead and Redlich elicited a good deal of evidence to show that this hypothesis was true in the community studied by them. Their findings may be summarized briefly as follows:

(*a*) Higher social class patients are usually treated by private practitioners or in private hospitals, lower class in state hospitals. This applies to schizophrenics as to other categories.

(*b*) Higher social class patients are much more likely to receive psychotherapy; lower social class patients are rather more likely to receive organic therapy, but a high proportion receive only custodial care.

(*c*) Lower social class patients are more likely to remain continuously in mental hospitals for long periods.

These findings may not, however, apply in Great Britain, where the pattern of psychiatric treatment is different. Under the National Health Service, free treatment is available to all, and the great majority of psychiatric cases are so treated; particularly in the case of schizophrenia only a small minority of patients are dealt with by private practitioners. Secondly, the use of psychotherapy for psychotic states is less in vogue here than in the United States, and differences in the social class distribution of this mode of treatment are therefore less probable. Thirdly, the average patient in an English mental hospital is less likely to be isolated from his own community than one in a large American state hospital, and there may not be the same tendency for chronicity to develop more readily in a state hospital than in a private institution (Pratt, 1948).

Even if significant differences do exist in the standard of treatment for the different social classes, this cannot wholly explain the social class gradient. Assuming that some approximation to the true incidence of schizophrenia can be obtained from hospital first-admission rates (the only reliable data at present available), any bias produced by differences in treatment must occur before the patient's first admission to hospital; in view of the fact that in-patient treatment has been orthodox for all cases of early schizophrenia, at least until the last few years, this seems highly improbable.

Investigations based on first-admission rates confirm the social class gradient (Brooke, 1959a; Stein, 1957; Registrar General, 1958). Brooke (1959b) has pointed out that mental hospital statistics can give only a rough approximation to the true incidence of mental illness in a population, and that for any individual patient a first admission to a mental hospital may not correspond with the first episode of mental illness. Nevertheless, first-admission rates remain the best available gauge for measuring the incidence of psychotic illness and provide perhaps the best arbitrary criterion for a "case" of schizophrenia (Milbank, 1953; Dunham, 1953). It seems reasonable to assume, therefore, that there is a true social class gradient in the incidence of schizophrenia, and that this cannot be explained by differences in treatment of the illness after diagnosis.

The third theory, that the social class gradient in schizophrenia reflects the varying stress of social and economic conditions in the community, is in some ways the most satisfactory. It offers analogy with the distribution of other diseases, such as pulmonary tuberculosis, chronic bronchitis, and rheumatic heart disease (Registrar General, 1954), where aetiological factors are better established. It does not require any proof of "drift", social mobility, or bias in treatment. It is compatible with the findings of Hollingshead and Redlich, that the incidence among persons *born* in slum areas is higher than in those born in good areas.

On the other hand, Hare's survey in Bristol (Hare, 1956a, b) suggested that the distribution of schizophrenia in that city could be correlated not entirely with social class distribution, but with the number of persons living alone in each district. This is the concept of "social isolation", and there exists a considerable body of evidence for the importance of this factor (Gerard and Houston, 1953; Hare, 1956a, b; Stein, 1957).

A study of the subsequent outcome of schizophrenic psychosis in the different social classes might well throw more light on the theories of causation. It seems likely that the same social and economic factors which may be implicated in producing the disease, may also have a role in its later development. Downward social and occupational drift might be seen to continue after discharge from hospital, and on subsequent readmissions; differences in management and treatment might result in an increased proportion of prolonged stay in hospital among lower class patients; social isolation might lead to failure of rehabilitation and a higher relapse rate among patients discharged to such conditions.

Once again the study of Hollingshead and Redlich seems the most comprehensive; yet again it is doubtful if their conclusions can be applied to conditions in Great Britain. They found that lower class patients had on average a longer continuous duration of stay, a longer period of psychiatric treatment, and a higher rate of re-entry into treatment. However, as has been mentioned, these differences are at least in part explicable by a bias in treatment—or lack of treatment—administered, and may not obtain in Great

Britain. Moreover, the categories of social class employed by Hollingshead and Redlich are not strictly comparable with the classification used in most British investigations (General Register Office, 1951). They used an "Index of Social Position", derived partly from an occupational scale, but also in part from a residential scale based on the type of district in which the patient lived, and in part from an educational scale. The "Index of Social Position" may yield results rather different from those obtained with the Registrar General's classification, *e.g.* it may produce findings weighted more in favour of social isolation, and less related to occupational status.

In Great Britain, Carstairs, Tonge, O'Connor, and Barber (1955) carried out a census of all patients resident in four London mental hospitals on a day in 1954. They found a social class distribution for schizophrenia comparable to the results obtained by other workers, but when the "long-stay" and "short-stay" patients (that is, those in hospital for more than and less than 2 years) were separated, the proportion of long-stay patients was found to be relatively higher in Social Class III, and the proportion of short-stay patients relatively higher in Social Classes IV and V. This suggests a correspondingly better prognosis for Class IV and V than for Class III, and is at variance with the American study.

More recently, however, Brooke (1959a) has investigated a much larger series consisting of all male schizophrenic patients over age 20 first admitted to English mental hospitals over a 6-month period. By analysing the number of these patients still in hospital at the end of each quarter for a total period of 2 years, she was able to demonstrate a clear social class gradient, for both single and married men, in terms of duration of hospital stay.

Wing, Denham, and Munro (1959), in comparing cohorts of schizophrenic patients discharged over two separate periods of time, noted that patients whose previous occupations had been unskilled did not carry a worse prognosis than others, in terms of duration of hospital stay. Moreover, the prognosis for unskilled labourers had improved significantly between 1950–1 and 1955–6.

Of other criteria of outcome, little is known. Harris and others (1956), in a follow-up survey of patients who had received insulin coma therapy at the Maudsley Hospital, found that over a 5-year period after discharge the majority of patients remained in the same social class as that to which they had belonged before admission—a finding which does not support the "drift" theory of schizophrenia. Markowe, Tonge, and Barber (1955), in a survey of psychiatric patients registered as disabled persons, concluded that successful rehabilitation largely turned on whether the individual had previously had a stable personality and a satisfactory work record; this survey was not limited to psychotic patients, and the patients' work records were not related to class status.

So far then, the available evidence is inconclusive and to some extent contradictory. In the present study an attempt is made to determine the relation between social class and the outcome of schizophrenia, by investigating a series of male first-admission cases.

Method

(1) A case was defined as "the first mental hospital admission of a male patient suffering from a schizophrenic illness". Cases were limited to those admitted to Bristol Mental Hospital (now Glenside and Barrow Hospitals) from 1949 to 1953 inclusive. This period was chosen for a number of reasons: it coincided with that used by Hare in his Bristol survey (Hare, 1955, 1956a, b); it centred in the 1951 Census; the psychiatric facilities in Bristol remained constant during that time; it allowed a 5-year follow-up for all patients from the date of first admission.

(2) The present series includes all cases from the Bristol area admitted to mental hospitals, except those which went to private mental hospitals outside the city, or to the one private nursing home which at that time dealt mainly with psychiatric cases. The number of cases thus missed could only be small. Hare (1955) attempted to trace all privately-treated cases, and of a total of 1,264 male cases of all diagnoses admitted during the relevant period, found only 32 privately treated.

(3) Diagnosis was obtained from the Mental Health Index Card file and was then checked with the patient's casenotes. The diagnostic categories used were based on those of the International Statistical Classification of Diseases, Injuries, and Causes of Death (World Health Organization, 1949).

The uncertainty of psychiatric diagnosis is one of the chief stumbling-blocks in all epidemiological research in this field. This is particularly true in the case of schizophrenic illness; the outer limits of the condition are ill-defined, and there appears to be little uniformity of diagnosis in different parts of the country, as shown for example by the Registrar General's regional figures.

In the present series every attempt was made to obtain as accurate a diagnosis as possible. Hare (1955) commented that the conditions obtaining in Bristol over the relevant period might be expected to lead to greater uniformity of diagnosis than in the country as a whole; the cases were diagnosed by a

group of psychiatrists working together in a single hospital with frequent opportunities for the interchange of clinical opinion. A review after an interval of from 5 to 10 years from the date of first admission threw a good deal of light on the patients' subsequent progress, and it seems reasonable to suppose that if a mistaken diagnosis had been made at the first admission, this would have become apparent during the subsequent progress of the illness, or at subsequent re-admissions to hospital.

To provide a check on the diagnosis obtained from a study of the case notes, in 48 cases of the present series (all patients discharged during the period 1953–7) a follow-up inquiry was made, including in each case a visit to the patient's place of residence, and whenever possible an interview with the patient himself. In addition, 36 patients currently under treatment were interviewed in hospital or at out-patient or follow-up clinics, in an attempt to confirm the stated diagnosis. In over 90 per cent. of the cases so interviewed and discussed with the consultant psychiatrists, the correct diagnosis could be ascertained by a perusal of the case notes.

The most difficult problem in diagnosis was that offered by the cases diagnosed as "paranoid state". The decision to include them as cases of schizophrenia in any survey must be somewhat arbitrary, since they represent a continuous gradation from undoubted paranoid schizophrenia to transient delusional states of good prognosis. In practice, no rigid rule was adopted, but the general principle accepted that the paranoid group of psychoses should be included in the main body of schizophrenia (Mayer-Gross, Slater, and Roth, 1954) and each case then considered according to the presenting clinical picture and later development of the illness.

(4) The patient's social class was determined in accordance with the Registrar General's "Classification of Occupations" (General Register Office, 1951), his occupation being recorded on the Mental Health Index Card, and on the first sheet of his case-notes. A social worker's report was also included in the case notes in most cases; this was based on an interview with the patient's next-of-kin, either in the hospital or at home. A standard proforma was used, which included space for a brief account of the patient's work record.

From these three sources it was possible to ascertain the patient's previous occupation, and two further methods of checking were also used. First, the occupation listed could be compared, in most cases, with that obtained by Hare in his original survey. Secondly, in 84 cases the patient or a member of his household was interviewed. This cross-check demonstrated that the social class grading from the records was extremely accurate, and in only three cases did the information from the records prove to be misleading.

Certain types of case presented special difficulty in social class grading. Students and schoolboys were given the class of their fathers. Patients who, because of personality disorders or developing mental illness, had had no fixed occupation during the 12 months or more before the first admission, were regarded as having the occupation which they had held longest since first starting work. In three cases the patient had never pursued any gainful occupation, because mental abnormality had been apparent from the time of leaving school. These patients, like the schoolboys, were given the same grading as their fathers. No retired men were included in the series.

The Registrar General's five social classes are based on "general standing within the community, economic circumstances not being taken into account except insofar as they are reflected in the Occupational Classification . . . assignment to an occupational group automatically attracts the social class grading appropriate to that occupational group" (General Register Office, 1951).

This classification has its limitations (Logan, 1954) and may be misleading in individual cases. It does not make use of place of residence, and so cannot be employed in evaluating "social isolation", nor can it be strictly compared with the "Index of Social Position" (Hollingshead and Redlich, 1958). It is, however, widely accepted that, in this country at least, occupation provides the best index of social status (Moser and Hall, 1954).

Employing the criteria described above, a series of 224 cases was obtained. Of these, five were excluded because the patients had died within 2 years of first admission. A further three patients who had died more than 2 years but within 5 years after first admission, were included in some of the analyses.

A proforma containing twenty items was now completed for each, using information obtained from the case notes, together with any out-patient or follow-up clinic notes. The items recorded were chosen as relevant to assessment of the following points:

(*a*) Age at first admission.

(*b*) Marital status at first admission.

(*c*) Address from which admitted.

(*d*) Diagnosis.

(*e*) Duration of first hospital stay.

(*f*) Mode of referral to mental hospital.

(*g*) Patient status on first admission.

(*h*) Main methods of treatment employed during first hospital stay.

(*i*) Clinical condition at discharge.

(*j*) Follow-up arrangements at discharge.

(*k*) Dates of subsequent admissions and discharges.

It was hoped to obtain from this information a guide to three main indices of prognosis: the length of stay in hospital, the outcome of treatment, and the re-admission rate.

RESULTS

Social Class Distribution, Marital Status, and Age at First Admission.—The results are shown in Table I.

TABLE I

DISTRIBUTION BY MARITAL STATUS, AGE AT FIRST ADMISSION, AND SOCIAL CLASS

Social Class		I	II	III	IV	V	Total
No. of Cases	Single ..	4	11	71	12	45	143
	Ever Married	2	8	41	5	20	76
	Total ..	6	19	112	17	65	219
Mean Age (yrs) ..		33·6	34·8	33·3	30·9	31·7	32·7

Here there is no significant correlation between marital status and social class ($\chi^2 = 1 \cdot 129$; $d.f. = 2$; $p > 0 \cdot 05$); marital status can therefore be ignored in calculating the effects of the social class distribution.

Age at first admission is another factor which may influence prognosis, but there seems to be no simple relationship (Parnell and Skottowe, 1959). Hollingshead and Redlich (1958) found that the age at which patients first came under psychiatric treatment was lowest in Social Classes I and II and highest in the lower social classes. Assuming the age at onset of the illness to be the same in all classes, this implies a delay in starting treatment for the lower class patients; if this is the case it would tend to worsen the prognosis for the latter.

In the present series there is no relation between social class and age at onset. The mean age at onset is actually slightly lower in Class IV and V than in Class I and II (31·5 as against 34·5 years). A *t*-test for the significance of difference between means, however, shows that this is not significant (Standard Error of Difference = 2·51; Difference between Means = 3·0). Age at first admission can also be ignored, therefore, in assessing the effects of social class distribution.

Duration of Hospital Stay.—This is now widely accepted as one of the most reliable indices of prognosis (Harris and Lubin, 1952; Orr, Anderson, Martin, and Philpot, 1955; Harris and others, 1956). It has been found repeatedly that a patient's chances of discharge decrease rapidly after he has been in hospital for 2 years continuously. A continuous stay in hospital of 2 years or more is now frequently used as a criterion in defining the chronic patient (Cross, 1954; Brown, Carstairs, and Topping, 1958; Brown, 1959; Wing and others, 1959). While the pattern of the mental hospital population is now undoubtedly changing, it seems likely that patients with the longest hospital stay will continue in the future, as in the past, to carry the worst prognosis. Certainly the ominous significance of a 2-year stay would have held true during the period of the present survey.

The relationship between duration of hospital stay and the patients' social status has been investigated by a number of workers, usually as one aspect of a more general investigation. Hollingshead and Redlich (1958) found that the duration of stay was longer in the lower social classes; the proportion of psychotic patients in their census who had been under continuous hospital care from first admission was 15·4 per cent. for Class I and II, as opposed to 56·3 per cent. for Class V patients. These authors also concluded that class differences in duration of hospital stay had not become any less marked in recent years, despite the introduction of modern methods of treatment.

In Great Britain, Carstairs and others (1955) came to a different conclusion, finding a higher percentage of long-stay cases among Class III than among Class V patients (50·9 per cent. compared with 31·6 per cent.). They suggested that the disparity between their figures and those of the American workers might be explained by the greater availability of treatment in Great Britain since the introduction of the National Health Service. Brooke (1959a), on the other hand, dealing with a larger series, found a positive correlation between social class and duration of stay.

The findings in the present survey (Table II, overleaf) werer oughly in agreement with Brooke's. Because of the small number of cases in this series, Classes I and II and Classes IV and V are grouped together for all statistical calculations.

Furthermore, of a total of 26 patients who remained in hospital continuously for over 5 years,

TABLE II

MALE SCHIZOPHRENICS FIRST ADMITTED TO BRISTOL MENTAL HOSPITAL, 1949–53

Duration of Stay (yrs)	Social Class			
	I and II	III	IV and V	Total
2 or More ..	1	13	20	34
Less than 2 ..	24	99	62	185

$\chi^2 = 7{\cdot}855$; $d.f. = 1$; $p < 0{\cdot}01$

none was from Class I and II, eight were from Class III, and eighteen from Class IV and V.

We can say, therefore, that in the present series social class is clearly related to duration of hospital stay, and that the lower the social status of an individual patient the greater the danger of his becoming a chronic hospital case.

A second important criterion in assessing prognosis is the total amount of time spent in hospital during a given period. The majority of psychiatric cases are now dealt with on a voluntary basis, and one result of this is that many leave hospital after a short stay, sometimes before their illness has been adequately treated. Moreover, the use of modern methods of treatment often produces rapid relief of the disturbing symptoms, yet leaves the patient prone to early relapse. The present tendency, therefore, is for schizophrenic patients to have a shorter stay in hospital after first admission than formerly, but to have a high readmission rate. Often, too, the second or third spell in hospital may be more prolonged, and the patient may lapse into a chronic hospital case at this stage. For these reasons it is helpful to consider the total amount of time spent in mental hospitals by a patient in the period of 2 years or more after first admission.

Harris and others (1956), in a follow-up survey of schizophrenic patients, compared the total time spent in hospital during a period of 5 years, with the patients' clinical and social condition at the end of the 5 years. They found that there was a highly significant relationship, and concluded that assessment of prognosis by duration of hospital stay did, in fact, give reliable results.

Brooke (1959a) calculated the total percentage of time spent in hospital in the 2 years after the first admission, and concluded that patients from Classes IV and V spent a greater proportion of the first 2 years in hospital than those from Class III; or, in other words, patients in Classes IV and V made a greater claim on hospital time than those in Class III. The results of the present inquiry bear this out (Table III).

TABLE III

TIME SPENT IN HOSPITAL IN FIRST 2 YEARS AND IN FIRST 5 YEARS AFTER FIRST ADMISSION

Time Spent in Hospital (mths)	Social Class			
	I and II	III	IV	V
During First 2 yrs	4·8	8·8	7·8	12·4
During First 5 yrs	6·2	15·6	17·9	26·5

These results are not entirely reliable, since they were obtained mainly from a study of hospital records. A certain number of patients who had no record of readmission may have left the Bristol area and have been readmitted to other mental hospitals. That this was so in some cases was deduced from the case notes, and the mental hospitals concerned were asked about the subsequent progress of these patients, but other readmissions outside the area may not have been recorded. It seems unlikely that upper social class patients would be more migrant than lower, and that a bias might thus have been introduced; nevertheless, the need for a more conclusive follow-up led to the study of the "Discharge Series", to be described later.

Readmission Rates.—This may be a significant pointer to the subsequent outcome of a series of cases. Brown and others (1958) noted, in their follow-up series of schizophrenic male patients who relapsed over a period of 6 years after discharge, that 74 per cent. did so in the first year.

In the present study the same criticism holds true for readmission rates as duration of stay, namely that a number of readmissions to other hospitals may have been missed; nevertheless, the patients in this series as a whole remained surprisingly static geographically, and the readmission rates obtained probably give a good approximation to the true picture (Table IV, opposite).

It seems, therefore, that patients in lower social classes are not only more likely to remain in hospital longer, but also tend to be readmitted more quickly than those from the upper social classes, and that both these factors lead to the lower class patients spending a longer time in hospital.

The third section of Table IV includes patients who have remained in hospital continuously for 2 years since the date of first admission and others who have been readmitted once or more. This convenient, if somewhat arbitrary, guide to prognosis emphasizes the social class gradient. A check of patients known to be in hospital 5 years from the date of first admission gave similar results: Class I and II three cases

TABLE IV

READMISSION OF PATIENTS DISCHARGED AFTER LESS THAN 2 YEARS, BY SOCIAL CLASS

Readmission		Social Class				
		I and II	III	IV and V	Total	
In First Year	No. ..	0	25	18	43	$p<0{\cdot}02$
	Per cent.	0·0	22·3	22·0	19·6	
Within 2 Years	No. ..	2	34	23	59	$p<0{\cdot}01$
	Per cent.	8·0	30·4	28·0	26·9	
In Hospital 2 Years from Date of First Admission	No. ..	1	23	28	52	$p<0{\cdot}01$
	Per cent.	4·0	20·5	34·1	23·7	
Total Number of Patients		25	112	82	219	

Clinical Condition at Discharge.—This is important in assessing prognosis. For a number of reasons, patients may leave hospital with persisting mental disturbance. Voluntary patients may discharge themselves against medical advice, sometimes before completing treatment. Certified patients may abscond or may be taken out of care by a relative against medical advice. In addition, some patients are discharged with medical concurrence, when treatment has failed to produce any improvement and it is felt that further hospital care is unlikely to be beneficial. Other patients improve to a moderate extent with treatment, but continue to show more or less mild residual symptoms, or an underlying abnormality of personality which is held to make the prognosis less hopeful.

More detailed information can often be obtained from a study of the case notes, but the simplest and most readily available indication is the classification as "Recovered", "Relieved", or "Not Improved" noted on the patients' case-sheet and on the Mental Health Index Card on discharge. The value of this classification is limited, since it gives only a rough idea of any individual patient's condition and is decided by individual psychiatrists who may apply different standards to the three categories. Nevertheless, it has been used frequently in follow-up studies, as a recognized method of assessment. In the present series a rough check was carried out by assessing twenty cases from a study of the case notes, as "Recovered", Relieved", or "Not Improved", and comparing the results with the assessment given on the Mental Health Index Card: a discrepancy was found in only two cases (10 per cent.). Table V, which excludes three patients who died while still in hospital, each after a stay of over 2 years, shows a higher proportion of Class IV and V patients either not improved at discharge or still in hospital. On the other hand, the proportion of Class IV and V patients rated as "Recovered" is higher than that of Class III patients. The possible significance of this is not clear, but may be related to the higher proportion of certified patients in the lower classes; these patients are generally not discharged until they are regarded as recovered. If we consider only patients discharged from hospital, no significant relationship is found between condition at discharge and social class ($\chi^2=9{\cdot}366$; $d.f.=4$. This is not quite significant at the 0·05 level of probability).

TABLE V

CONDITION AT DISCHARGE, BY SOCIAL CLASS

Condition at Discharge		Social Class			
		I and II	III	IV and V	Total
Recovered	No. ..	10	21	18	49
	Per cent.	40·0	19·1	22·2	22·7
Relieved	No. ..	13	63	29	105
	Per cent.	52·0	57·3	35·8	48·6
Not Improved	No. ..	2	19	18	39
	Per cent.	8·0	17·3	22·2	18·1
Still in Hospital	No. ..	0	7	16	23
	Per cent.	0·0	6·4	19·8	10·6

When, however, patients not improved at discharge are grouped with those still in hospital, the proportions of such 'treatment failures' are 8 per cent. for Social Classes I and II, 23·6 per cent. for Class III, and 42 per cent. for Classes IV and V. Grouped in this way Table V shows a highly significant relationship between response to treatment and social class ($\chi^2=18{\cdot}793$; $d.f.$ 4; $p<0{\cdot}01$).

There are several possible explanations. First, patients in the lower social classes may begin treatment at a later stage in their illness, and hence present more intractable therapeutic problems. Secondly, they may receive less effective and vigorously administered treatment. Thirdly, they may be less cooperative in treatment, regarding the hospital regime as authoritarian rather than therapeutic, and terminating treatment as soon as possible.

The first possibility is outside the scope of the present investigations, although it has been noted already that the average age of patients in the different social classes at first admission is not significantly different, which is against the hypothesis that the lower groups start treatment at a later stage of illness.

The second possibility, that of differences in treatment, will be discussed later.

The third possibility, that the patients' co-operation in treatment may vary with social class, can be checked to some extent by considering the number of patients who discharge themselves, or are discharged at the request of their relatives, against medical advice. This information is readily obtained from the patients' case notes, since for medico-legal reasons it is standard practice to record the fact when a patient leaves against advice. Clearly, departure against medical advice is likely to be closely correlated with poor clinical state at the time of discharge and with a bad prognosis; in almost every case the psychiatrist's reason for advising against discharge is that the patient is mentally unfit to leave, or that the environment to which he will return is unsuitable.

A review of the case notes confirmed this; in almost every case the condition at discharge of patients departing against medical advice was recorded as "Not Improved". In the few cases given as "Relieved" the improvement over their clinical state at admission was only very slight, and their course of treatment was not completed when they left.

In Table VI, "left against medical advice" includes voluntary patients who discharged themselves against medical advice, certified patients who absconded and remained out of hospital for over 14 days, and certified patients taken out by relatives under Section 72 of the Lunacy Act, despite medical warning that this was unwise. The proportion of patients who left hospital in these circumstances is lowest in Social Classes I and II and highest in Social Classes IV and V.

TABLE VI

CO-OPERATION IN TREATMENT, BY SOCIAL CLASS

Patient Discharged	Social Class			
	I and II	III	IV and V	Total
Against Medical Advice ..	2	18	22	42
With Medical Agreement ..	23	85	43	151

$\chi^2 = 9{\cdot}466$; $d.f. = 2$; $p < 0{\cdot}01$

POSSIBLE CAUSES OF THE SOCIAL CLASS GRADIENT

So far the findings indicate that length of stay in hospital, condition at discharge, probability of relapse, and over a given period of years the total amount of time spent in hospital, are all to some extent related to social class. At this point it may be convenient to consider some of the possible causes, and these may be classified as follows:

(1) The mode of referral to hospital.
(2) The patient's status in hospital.
(3) The type of treatment given.
(4) The attitude to treatment of the patient and his relatives.
(5) The arrangements for follow-up supervision and treatment.

(1) *Mode of Referral.*—Broadly speaking, an individual may seek psychiatric treatment for one of two reasons: either he wants relief from distressing symptoms, and believes that a psychiatrist can provide this; or he is persuaded, or coerced, by those around him—relatives, friends, colleagues, employer, social agency—who recognize, better than he does himself, the need for treatment. But the belief, or recognition that a particular symptom, or a particular abnormality of behaviour, is psychologically determined, may require a certain level of sophistication; lacking this, a variety of other explanations may be invoked. In such cases the path by which the patient eventually arrives at the psychiatrist may be a long and devious one, and the mental illness may be well established before treatment is started.

It is also possible that the patient's willingness to submit to psychiatric treatment may vary with his position in the class structure. The stigma attaching to mental hospital treatment is gradually diminishing but is more likely to persist among poor, uneducated people, for whom the psychiatrist and the hospital are to some extent symbols of authority and, as such, viewed with suspicion. Members of the lower social classes may thus tend to avoid the psychiatric services open to them, and come into contact with them only when the worsening of mental illness has led to harmful or anti-social behaviour and they are compulsorily brought into hospital. Conversely, members of the upper social classes are more aware of modern concepts of mental illness and neurosis, and of the possible treatment agencies, and are not so awed by authority nor so suspicious of treatment. They may be able to afford private consultation and psychotherapeutic sessions not available to others, and may be more willing and able to take time from work than those holding insecure or casually paid jobs.

This hypothesis was tested by Hollingshead and Redlich, and was found to correspond with the mode of referral of patients in New Haven. Thus, of schizophrenic patients entering treatment for the first time, all those in Class I and II were referred either by

private physicians or by family and friends; while 52·3 per cent. of those in Class V were referred by the police and courts, and 17·6 per cent. by social agencies.

The methods of referral employed are obviously dependent upon the local facilities provided. The psychiatric services in Bristol during the period under survey were probably fairly typical of those in most English industrial cities at the time. These are listed in Table VII, together with the cases in each social class.

TABLE VII

METHOD OF REFERRAL TO HOSPITAL, BY SOCIAL CLASS

Method of Referral	Social Class			
	I and II	III	IV and V	Total
Private Consultation ..	6	3	1	10
Domiciliary Visit (National Health Service)	1	7	4	12
General Hospital Out-Patient Department	14	65	33	112
General Hospital In-Patient	1	4	4	9
Direct from General Practitioner	2	6	7	15
Observation Ward or Duly Authorized Officer ..	1	27	33	61

In the social class distribution shown in Table VII, two salient features can be observed. The first is the relatively high number of private consultations for the Class I and II patients. The total number is small, but the proportion among the Class I and II group is quite high (24 per cent.) and significantly greater ($p<0·01$) than that in Classes III, IV, and V combined, *i.e.* 2 per cent. A much larger series of cases would be required, however, to investigate the social class distribution, and effect on outcome, of private treatment.

The second striking feature is the high proportion among the lower social classes of patients admitted *via* the Observation Ward or Duly Authorized Officer. The preponderance in Classes IV and V of this type of case is more clearly seen in Table VIII. This confirms the hypothesis already stated, that members of the lower social classes are more likely to be unwilling or reluctant hospital patients, with a concomitantly unco-operative attitude to treatment. It also indicates that on average they may be more severely mentally disturbed, or have a mental illness of longer standing than members of the upper social classes at the time of admission.

TABLE VIII

ADMISSIONS ON STATUTORY ORDERS, BY SOCIAL CLASS

Method of Referral	Social Class					
	I and II		III		IV and V	
	No.	Per cent.	No.	Per cent.	No.	Per cent.
Observation Ward and Duly Authorized Officer ..	1	4	27	24	33	40
All Other Sources	24	96	85	76	49	60

$\chi^2=14·124$; $d.f.=2$; $p<0·01$

(2) *Patient Status.*—The considerations mentioned in discussing Observation Ward cases also applied largely to those who were admitted to mental hospitals under certificate. Certified status may be related to an unfavourable prognosis, for several reasons. First, it may be argued that only the more severe cases will be likely to warrant certification, and that these may be expected to carry a worse prognosis. Secondly, the stigma of certification may have an adverse effect on the patient's morale, and so reduce his chances of speedy recovery. Thirdly, the processes of medico-legal machinery may prove slow and cumbersome, serving to lengthen the interval between the patient's recovery or improvement and his discharge from hospital. Fourthly, hospital status, like the mode of referral, may be regarded as an index of the type of relationship existing between the patient and the treatment agency. In almost every case, a patient is not certified unless he has expressed himself as unwilling to undergo voluntary treatment; while a voluntary patient is in the same position as any other individual freely seeking medical treatment, a certified patient, particularly in the early stages of his hospital stay, is compulsorily detained and unwelcome treatment is thrust upon him for an illness to which he may not admit. It seems reasonable to suppose that the certified patient will be less co-operative in treatment, and less likely after discharge from hospital to retain grateful or happy memories of his stay. This in turn may lead to a less satisfactory follow-up and to further difficulties should readmission later prove necessary. On the other hand, since certified patients are usually kept in hospital until they are thought to have made a fair improvement, there is less danger with them than with voluntary patients of discharge before treatment is completed, or while the mental balance is still seriously disturbed; this may make for a better prognosis for the certified patient.

In the present study, the incidence of certification was found to be related to social class (Table IX).

TABLE IX

IN-PATIENT STATUS, BY SOCIAL CLASS

In-Patient Status	Social Class			
	I and II	III	IV and V	Total
Certified ..	3	20	25	48
Voluntary or Informal	22	92	57	171

$\chi^2 = 6{\cdot}032$; $d.f. = 2$; $p < 0{\cdot}05$

Moreover, when in-patient status was compared with duration of hospital stay, it was found that a considerably higher proportion of certified patients became long-stay cases. In Table X the mean duration of stay is limited to the period of 5 years after the first admission. Clearly, the certified patient carries a considerably poorer prognosis, and the preponderance of patients from the lower social classes among the certified cases is related to their worse prognosis.

TABLE X

DURATION OF HOSPITAL STAY, BY IN-PATIENT STATUS

Duration of Stay (yrs)	Certified	Voluntary or Informal
More than 2	19	15
Less than 2	29	156
	$\chi^2 = 27{\cdot}13$; $d.f. = 1$; $p < 0{\cdot}01$	
Mean Duration of First Hospital Stay (mths) ..	25·9	8·4

(3) *Methods of Treatment.*—The type of treatment administered is an important factor in assessing prognosis. The existence of a relationship between the patient's social status and the type of treatment employed would do much to explain the differences, so far discovered, in the outcome of the illness. While the American work is impressive, one cannot assume that the same findings would hold true in other countries. In particular, the existence in Great Britain of the National Health Service, which in theory makes available to every member of the community, free of charge, every orthodox form of treatment, might be expected to avoid the anomalies of the American system, whereby the type of treatment the patient receives is largely determined by his ability to pay for it.

Again, the same social class significance cannot be attached to the type of "treatment agency" used by patients in Britain. In England the great majority of all mental hospital patients are treated under the National Health Service, and the English state hospital does not carry the same stigma of social inferiority as its American counterpart. Nor is the average patient in an English mental hospital so likely to be isolated from his family and his community as a patient in an American state hospital, which is often a very large institution serving a huge catchment area.

During the period under survey, it was orthodox practice in Bristol, as in most parts of Great Britain, to advise in-patient treatment for all cases of schizophrenia. The treatment administered to the patients in this series is thus representative of the treatment of schizophrenia in Bristol during the period under survey. The number of cases treated by each of the chief recognized methods is listed in Table XI for each social class. The nature of the treatment was obtained from a study of the case notes. For long-stay patients, only treatment administered during the 2 years after admission was recorded.

TABLE XI

TREATMENT GIVEN, BY SOCIAL CLASS

Type of Treatment		Social Class				
		I and II	III	IV	V	Total
Deep Insulin Coma	No. ..	7	43	8	17	75
	Per cent.	28·0	38·4	47·0	26·1	34·2
Electro-Convulsive	No. ..	8	42	6	25	81
	Per cent.	32·0	37·5	35·2	38·4	36·9
Other Organic Methods	No. ..	2	9	1	2	14
	Per cent.	8·0	8·0	5·9	3·1	6·4
Psycho-therapy	No. ..	3	8	0	2	13
	Per cent.	12·0	7·1	0·0	3·1	5·9
No Systematic Treatment	No. ..	8	34	5	27	74
	Per cent.	32·0	30·4	29·4	41·5	33·7

Prefrontal leucotomy had been performed in only six cases, and its use was not related to social class. The rather surprisingly small number of leucotomies is explained by two facts: first, prefrontal leucotomy was not in favour for cases of schizophrenia in this hospital group, even during the period under survey (1949–53); secondly, it was unusual for leucotomy to be advised during a patient's first mental hospital admission.

Sedation with barbiturates, paraldehyde, or other drugs was not classed as a major method of treatment. All cases not included in one of the first four categories were classed as having no systematic treatment.

The term "psychotherapy" was reserved for cases in which a formal and systematic psychotherapeutic approach had been made by a senior psychiatrist. As has been mentioned, this form of treatment was not in wide use for cases of schizophrenia, and the total number of cases is small. In practice the cases so listed were almost exclusively ones in which group psychotherapy was employed, in conjunction with or subsequent to organic therapy, and they were almost entirely cases in which paranoid features predominated.

The total number of individual courses of treatment recorded is higher than the number of patients, since a number of individuals received more than one form of treatment.

A brief inspection of Table XI reveals that there was no clear relation between treatment and social class. Deep insulin coma therapy, at that time the treatment of choice in early schizophrenia, was given as often to patients of Class V as to those of Class I and II. So was electro-convulsive therapy, which was evenly divided among the social classes. Only two findings appear to differ from a random distribution of treatment: the small number in Class IV and V who received psychotherapy, and the large number in Class V who received no systematic treatment.

There is an observable trend for upper class patients to receive psychotherapy more often than lower class patients ($\chi^2 = 5 \cdot 34$; $d.f. = 1$; $p < 0 \cdot 05$). The number is too small, however, for any definite conclusions to be drawn; a larger series would be required, and preferably one in which diagnoses other than schizophrenia were under consideration. Among patients receiving no systematic treatment, there is no social class gradient: Classes I to IV fall slightly below the expected frequency, and Class V has a higher frequency than expected, but the number of cases is too small for this to be significant.

In general, there is no definitely established relationship between the patient's social class and the type of treatment administered. Even if a much larger sample of patients was considered, it seems very unlikely that anything like the New Haven findings would be observed. Whatever the underlying causes behind the less favourable outcome for lower class patients, it does not seem that this can be attributed to any gross differences in the methods of treatment used in hospital. Whether other less tangible factors in treatment, such as the attitude towards the patient of medical and nursing staff, the thoroughness with which treatment is pursued, the degree of improvement required before treatment is stopped, the patient's concept of the treatment process—whether these play any part in determining outcome, is a subject which requires investigation but is outside the scope of the present study.

(4) *Attitude to Treatment.*—This has already been discussed in considering those patients who left hospital against medical advice and the class distribution of certified patients. One has the impression that the upper class patient and his relatives establish better rapport with the hospital community than those of lower social status. Hollingshead and Redlich emphasize the importance in this of the psychiatrist's own social prejudices and lack of understanding of his lower class patients. Other possible factors may be equally important, however; for example, the attitude of nursing staff towards a patient of higher social standing than their own, or the effect on a patient of one social class being placed in a ward of patients mainly from a different class.

(5) *Follow-up Arrangements.*—On leaving hospital a patient could be referred to one or more possible agencies for after-care and supervision and this would normally be recorded in his case notes. At the same time, a discharge-summary or letter would be sent to each patient's general practitioner, and a copy of this would be filed with the case notes. Whenever a patient remained under psychiatric surveillance, a record of his attendances with clinical progress notes would be kept on a special card. From those sources it was possible to discover in almost every case what follow-up supervision, if any, the patient had received after discharge.

Psychiatric supervision was taken to include:

(*a*) Patients referred back to the psychiatrist who had seen them in private consultation before admission to hospital.

(*b*) Patients referred back to the general hospital out-patient clinic from which they had been admitted to hospital.

(*c*) Patients referred to a special "follow-up clinic" maintained and staffed by the mental hospital group.

(*d*) Patients referred to the Bristol Day Hospital for a period of daily attendance and possibly further psychiatric treatment.

Patients *not* included as having psychiatric supervision included:

(*a*) Those discharged to the care of their general practitioners.

(*b*) Those recommended for supervision by the Local Authority Mental Welfare Department, but without other supervision.

(*c*) Those visited at home by the hospital social workers, but without other supervision.

(*d*) Those for whom no arrangements were made. This included patients who had absconded, or who were about to leave the area.

In Table XII patients are listed as having follow-up supervision, if arrangements were made for it and if they attended for a follow-up interview at least once. Follow-up arrangements were made in over two-thirds of all cases discharged, but the period of follow-up varied considerably and on average, patients did not attend more than three times before either defaulting or being discharged. It seems doubtful therefore whether follow-up supervision played an important role in the patient's subsequent progress. Table XII demonstrates a tendency for a social class gradient in follow-up supervision, but this is not statistically significant.

TABLE XII

PATIENTS RECEIVING PSYCHIATRIC FOLLOW-UP SUPERVISION, BY SOCIAL CLASS

Psychiatric Supervision	Social Class			
	I and II	III	IV and V	Total
Given	20	73	40	133
Not Given ..	5	30	25	60

$\chi^2 = 3{\cdot}24$; $d.f. = 2$; $p > 0{\cdot}05$

SOCIAL ISOLATION

The influence of "social isolation" on prognosis was examined by a separate analysis of those patients who were found to have been living out of their family setting immediately before admission. Patients living with parents, spouses, siblings, or children were regarded as having been "in a family setting", and patients living alone or in lodgings were regarded as "out of a family setting". No patient was included in the latter category unless he was known to have been living away from his family for at least one month before admission, and no patient admitted from another hospital or institution was included. A study of the case notes and social workers' reports yielded thirty patients who were out of a family setting. These thirty cases were then checked for three of the main points in assessing outcome: the number who became long-stay patients; the number regarded as "treatment failures" (*i.e.* discharged "not improved", or still in hospital); the mean length of time spent in hospital during the 2 years after admission. From Table XIII, in which the resulting figures are compared with those already obtained for the whole series, a number of points emerge:

TABLE XIII

CASES OUT OF FAMILY SETTING COMPARED WITH WHOLE SERIES

Cases	All Cases				Cases Out of Family Setting			
Social Class ..	I and II	III	IV and V	Total	I and II	III	IV and V	Total
Number of Cases	25	112	82	219	3	10	17	30
Long-stay Cases (2 Yrs or More)	1	13	20	34	0	4	5	9
Treatment Failures ..	2	26	34	62	0	5	9	14
Total Time in Hospital in First 2 Years (in mths)	4·8	8·0	11·4	9·2	4·0	14·2	12·5	13·1

(1) There is a preponderance of cases from Social Class IV and V in the group designated out of family setting. Seventeen out of thirty (56·7 per cent.) are drawn from Class IV and V, as compared with 82 out of 219 (36·4 per cent.) in the whole series. This excess of lower class cases is significant ($\chi^2 = 5{\cdot}484$; $d.f. = 1$; $p < 0{\cdot}02$). This finding is not unexpected. The hypothesis of "social isolation" has already been put forward as one explanation for the social class gradient in schizophrenia .Hare (1956b), in his Bristol survey, found that both social class and "family setting" were related to the incidence of schizophrenia; the two were to some extent correlated, for a high proportion of the cases out of family setting came from the poor central area of the city; but a number were also drawn from the "good" central area in which there were a large number of lodging-houses and persons living alone. Conversely, few cases of schizophrenia were drawn from the council housing estates, although these housed a large proportion of lower class persons. The most significant factor correlated with the incidence of schizophrenia in the different wards of the city was not the mean rateable value but the proportion of single-person households in each ward.

Stein (1957), in her London survey, carried this line of investigation a step further, for she found the maximum incidence of schizophrenia among patients in Class V living in the London boroughs with the highest number of "non-private households" and "one-person households"—that is, the incidence was highest when the two precipitating factors of low social class and "social isolation" were found in conjunction. This is in keeping with the observation that the highest incidence rates for schizophrenia are found among kitchen hands, domestic servants, and casual labourers (Brooke, 1957; Registrar General, 1958).

(2) The prognosis is worse for patients out of family setting than for others. Nine out of thirty (30 per cent.) remained in hospital for over 2 years, compared with 34 out of 219 (15·5 per cent.) in the whole series. This is a significant excess ($\chi^2 = 5 \cdot 554$; $d.f. = 1$; $p < 0 \cdot 02$). Fourteen out of thirty (46·7 per cent.) were classed as "treatment failures" compared with 62 out of 219 (28·3 per cent.) in the whole series. Again, this is a significant excess ($\chi^2 = 5 \cdot 771$; $d.f. = 1$; $p < 0 \cdot 02$). Finally, the mean total time spent in a mental hospital during the 2 years after admission is 13·1 months for the patients out of family setting and 9·2 months for the whole series.

These results also are not surprising. The schizophrenic patient living alone, often out of touch with his relatives, with few close friends or none, often drifting from one casual job to another, is less likely to be persuaded at an early stage of his illness to seek medical aid, or to persevere with treatment once it has been started. His abnormalities of behaviour are more likely to be tolerated, or to pass unnoticed, in the milieu in which he lives. Moreover, he tends to become more isolated from the community more rapidly once he has entered hospital. There is no pressure from relatives for his discharge, and the lack of any home-address to which he can be discharged or of a job to which he can return, may render him a social problem of disposal even when his mental symptoms have abated.

(3) While the prognosis is appreciably worse for patients out of family setting, in the present series it appears to be worst of all for patients from Social Class III, but the numbers are small and the higher percentage of long-stay cases in Class III is unlikely to be significant compared with Classes IV and V; indeed, the social class gradient in prognosis disappears when only cases out of family setting are considered. Conversely, when only cases *in* family setting are considered, the social class gradient in prognosis is clearly evident (Table XIV). Thus, while the unfavourable prognostic factors of low social class and "social isolation" are correlated, they are by no means identical, and one cannot be invoked to explain the other.

TABLE XIV

PROGNOSIS AND SOCIAL CLASS OF CASES IN FAMILY SETTING

Social Class ..	I and II	III	IV and V	Total
Number of Cases	22	102	65	189
Long-stay Cases ..	1	9	15	25
Treatment Failures	2	21	25	48

The geographical distribution of patients of bad prognosis was consistent with the social class gradient. Of 28 patients admitted from private addresses within the City of Bristol who remained in hospital continuously for over 2 years, fourteen came from the poor central area (the lodging-house and slum area), eight from the peripheral council housing-estate areas, and six from the "good" residential and heterogeneous areas. Of 51 patients listed as "treatment failures", 21 came from the poor central area, sixteen from the council housing-estate areas, and fourteen from the residential and heterogeneous areas.

SUMMARY

The relationship between social class and prognosis has been studied for 219 male schizophrenic patients first admitted to a mental hospital during a 5-year period. The following conclusions were reached:

(1) The proportion of patients who became long-stay cases was related to social class, being significantly higher in the lower social classes.

(2) The mean duration of stay in hospital was related to social class, and was longer for the lower classes.

(3) Response to treatment, as measured by the rate of discharge and clinical state at discharge, was related to social class, and was less favourable among the lower classes.

(4) These findings could not be explained by correlation with age at admission or with marital status.

(5) There was no significant relationship between social class and the formal treatment provided in hospital, nor between social class and follow-up supervision.

(6) There was a significant relationship between social class and mode of referral to hospital, between social class and in-patient status, and between social class and co-operation in treatment.

(7) "Social isolation" was related to prognosis, and also to some extent to social class, but the latter had a prognostic influence independent of the patient's family setting.

REFERENCES

Brooke, E. M. (1959a). "2nd International Congress for Psychiatry, Zurich, 1957". Congress Report, vol. 3, p. 52.

—— (1959b). *J. ment. Sci.*, **105**, 893.

Brown, G. W. (1959). *Brit. med. J.*, **2,** 1300.
——, Carstairs, G. M., and Topping, G. (1958). *Lancet*, **2,** 685.
Carstairs, G. M., Tonge, W. L., O'Connor, N., and Barber, L. E. D. (1955). *Brit. J. prev. soc. Med.*, **9,** 187.
Cross, K. W. (1954). *Ibid.*, **8,** 29.
——, Harrington, J. A., and Mayer-Gross, W. (1957). *J. ment. Sci.*, **103,** 146.
Dunham, H. W. (1953). *Amer. J. Psychiat.*, **109,** 567.
Gerard, D. L., and Houston, L. G. (1953). *Psychiat. Quart.*, **27,** 90.
Hare, E. H. (1955). *Brit. J. prev. soc. Med.*, **9,** 191.
—— (1956a). *J. ment. Sci.*, **102,** 349.
—— (1956b). *Ibid.*, **102,** 753.
Harris, A., Linker, I., Norris, V., and Shepherd, M. (1956). *Brit. J. prev. soc. Med.*, **10,** 107.
——, and Lubin, A. (1952). *Monatsschrift Psychiat. Neurol.*, **124,** 126.
Hollingshead, A. B., and Redlich, F. C. (1958). "Social Class and Mental Illness". Wiley, New York.
General Register Office (1951). "Classification of Occupations, 1950". H.M.S.O., London.
Lapouse, R., Monk, M. A., and Terris, M. (1956). *Amer. J. publ. Hlth*, **46,** 978.
Logan, W. P. D. (1954). *Brit. J. prev. soc. Med.*, **8,** 128.
Markowe, M., Tonge, W. L., and Barber, L. E. D. (1955). *Ibid.*, **9,** 39.
Mayer-Gross, W., Slater, E., and Roth, M. (1954). "Clinical Psychiatry". Cassell, London.
Milbank Memorial Fund (1953). "Interrelations between the Social Environment and Psychiatric Disorders". 129th Annual Conference, 1952). New York.
Morrison, S. L. (1959). *J. ment. Sci.*, **105,** 999.
Moser, C. A., and Hall, J. R. (1954). *In* "Social Mobility in Britain", ed. D. V. Glass, p. 29. Routledge and Kegan Paul, London.
Orr, W. F., Anderson, R. B., Martin, M. P. ,and Philpot, D. F. (1955). *Amer. J. Psychiat.*, **111,** 576.
Parnell, R. W., and Skottowe, I. (1959). *Brit. med. J.*, **2,** 1296
Pratt, D. (1948). "Public Mental Hospitals in England. A Survey". National Mental Hospital Foundation, Philadelphia. (Typescript.)
Registrar General (1954). "Decennial Supplement, England and Wales, 1951. Occupational Mortality, Pt. I". H.M.S.O., London.
—— (1958). "Statistical Review of England and Wales for 1952–3", Supplement on Mental Health. H.M.S.O., London.
Stein, L. (1957). *Brit. J. prev. soc. Med.*, **11,** 181.
Wing, J. K., Denham, J., and Munro, A. B. (1959). *Ibid.*, **13,** 145.
World Health Organization (1949). "Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death". H.M.S.O., London.

Brit. J. prev. soc. Med. (1961), **15**, 31–41

SOCIAL CLASS AND PROGNOSIS IN SCHIZOPHRENIA. PART II

BY

B. COOPER

Glenside and Barrow Hospitals, Bristol

The information obtained from the first-admission series was felt to be incomplete, for several reasons. First, a number of the patients had been lost sight of after the first admission; while it could be safely assumed that none had re-entered the Bristol Mental Hospital group, it was possible that some had subsequently been admitted to other mental hospitals without the Bristol hospital being notified. (Normally a request from another mental hospital for loan of a patient's case-sheets was entered in his record, but this may not have been done in every case.) Secondly, while the criteria used as indices of prognosis are widely accepted, one would wish to have more definite information on the patient's condition at a given length of time after his discharge from hospital. Thirdly, more precise information was required about the unfavourable factors operating in the lower social classes.

Method

The period 1953 to 1957 inclusive was chosen, as this made possible a follow-up of at least 2 years in every case, and was the most recent sample fulfilling this condition which could be obtained. A "case" was therefore defined as: "A male patient discharged from Bristol Mental Hospital group during the period 1953–7, after his first stay in any mental hospital, and with a diagnosis of schizophrenia". The other criteria adopted were similar to those used for the admission series.

Diagnosis.—This was initially obtained from the patient's case-notes, and was the diagnosis given at the time of discharge from hospital. Any modification of diagnosis on subsequent admissions was noted, and if the patient, in the light of his later progress, was given a diagnosis other than schizophrenia, he was discarded from the series. The diagnosis was also reassessed during the course of the survey by interviews with the patient and his relatives, and by discussion with the senior psychiatrist most in touch with his case. As a result the final diagnosis was considered to be reliable in the great majority of cases included. Formal diagnoses were based on the W.H.O. International Statistical Classification (1949), but not accepted unless a convincing clinical description was recorded in the case-notes.

Social Class.—This was first obtained by comparing the patient's occupation before admission, as recorded in the case-notes, with the Registrar General's "Classification of Occupations" (General Register Office, 1951).

Later, during the follow-up investigation, the patient's occupational record was checked at an interview with him or his relatives, and his social class was amended if it had not been recorded correctly. As has been mentioned already, the information obtained from the clinical notes and social worker's reports was almost always accurate; in about a dozen cases, however, the patient's social class rating was amended after interview.

An interview schedule, covering 35 items considered relevant in assessing outcome, was completed for each patient under survey, in two stages. The first stage consisted of a study of the patient's case-notes, covering all in-patient treatment from the date of first admission, from which the following data was extracted:

(1) Age at first discharge.
(2) Marital status at first discharge.
(3) Diagnosis at first discharge.
(4) Duration of stay in hospital.
(5) Treatment received while in hospital.
(6) In-patient status before discharge.
(7) Clinical condition at discharge, and prognosis given, if any.

(8) Occupation and social status before admission.
(9) Address to which discharged.
(10) Whether discharged to relatives or to other accommodation.
(11) Dates of any recorded subsequent admissions to hospital.

The second stage consisted of an interview with an informant who was able to give reliable information about the patient's progress and current condition. Whenever possible the informant was the housekeeper of the domestic group in which the patient was living, or had lived for the greater part of the time since his discharge from hospital. When the patient was living alone he himself was interviewed. Finally, some 35 patients who were currently receiving in-patient treatment, or were attending psychiatric clinics, were interviewed, as well as their relatives.

During the second stage of investigation, the following information was collected:

(1) Composition of the patient's current household.
(2) Current occupation and length of time for which it had been followed.
(3) Current economic status (self-supporting, partly dependent, or completely dependent).
(4) Present personality and social behaviour (normal, mildly disturbed, or grossly disturbed).
(5) Standard of self-care, judged by toilet, care of appearance, and ability to handle money and look after his affairs.
(6) Whether currently under any form of psychiatric supervision.
(7) Work record before the first admission to hospital, with particular reference to job or jobs held in the year immediately preceding admission.
(8) Details of work record during the 12 months immediately after the first discharge from hospital, with particular reference to periods of unemployment and difficulty in returning to work.
(9) Later admissions to a mental hospital after first discharge.
(10) Assessment of social class of household.
(11) Assessment of reliability of interview.

A study of the case-histories showed that a number of patients, who had been admitted to hospital initially as voluntary patients and had shortly afterwards discharged themselves against medical advice while still severely mentally disturbed, had been returned under certificate within a short time, and had then remained in hospital until their condition was relieved. It was felt that, for such cases, to take the day when the patient departed against advice as the date of first discharge, would give a misleading picture, since any attempt at rehabilitation and return to normal life was virtually impossible. For this reason the date of discharge was taken to mean "the date on which the patient was first discharged from hospital for a period of over one month". If a patient had been readmitted in less than one month, his subsequent stay in hospital was counted, for the purpose of this survey, as part of his first admission stay. For certified patients who were sent out "on trial", the date of discharge was taken to be that on which their period of "trial" was completed and they were officially discharged. This was thought to be more logical, since a patient "on trial" was not permitted to seek work.

The total number of male schizophrenics discharged during the period under survey was 237 (not counting six who went direct to other mental hospitals). Of this total, fifteen were known to have gone to addresses outside the Bristol area. During the survey, six patients were found to have died since discharge, five were rejected as not convincing cases of schizophrenia, two refused interview, and seventeen were "non-contacts", that is, they were eventually discovered to have left the Bristol area, or were simply untraceable. Eventually, therefore, a total of 192 interview schedules was completed.

Results

The interview schedules being completed, the sample was analysed as before, for distribution of social class, age, and marital status (Table I).

TABLE I

AGE, MARITAL STATUS, AND SOCIAL CLASS OF DISCHARGE SERIES

Social Class		I and II	III	IV and V	Total
No. of Cases	Single	13	66	47	126
	Ever Married	7	42	17	66
	Total	20	108	64	192
Mean Age at Discharge (yrs)		32·7	29·8	31·9	30·8

The distribution by social class is approximately the same as that found in the admission series, the main difference being a slightly higher proportion of Class III patients. (The proportion of Class IV and V cases, nineteen and 45 respectively, was also roughly as expected.)

Also as in the admission series, there is no positive relation between marital status and social class ($\chi^2 = 2{\cdot}718$; $d.f. = 2$; $p > 0{\cdot}05$), and there is no class gradient for age at discharge. Neither of these

factors, therefore, can be responsible for differences of outcome. Other factors of prognostic significance which must be considered, include duration of hospital stay, treatment given in hospital, and condition at discharge.

Duration of stay in hospital has already been discussed, and the bad prognosis of the long-stay patient has been indicated. Whether this holds good for the long-stay patient who is eventually discharged from hospital is not so clear. Brown, Carstairs, and Topping (1958), studying long-stay patients only, found that therewas no direct relationship between length of stay and success or failure after discharge, but the schizophrenic patients with over 10 years' stay actually did better than the rest. It seems unlikely, however, tha tsuch a relationship would be found if short-stay patients only were considered. One would expect rather that, of patients discharged with medical approval, the prognosis would be better for the milder short-stay cases.

Table II shows the mean duration of stay, together with the number of long-stay patients in each social class. The total number of patients leaving after 2 years or more is small, as might be expected, considering the relatively poor chance of discharge for such patients. Accordingly, to give a clearer picture, the number of patients leaving after one year or more has also been included. There is a tendency for those in the lower social classes to have a longer duration of stay and a higher proportion of long-stay patients; these points suggest that these patients may have a less favourable outcome in the years after discharge. The number of chronic patients at this stage is small, however, and these patients were not faced with the more severe problem of rehabilitation of the chronic patient.

TABLE II

DURATION OF HOSPITAL STAY, BY SOCIAL CLASS

Hospital Stay	Social Class			
	I and II	III	IV and V	Total
Mean Duration (mths)	4·8	6·3	8·3	6·8
Patients Leaving after 2 Years or More ..	1	5	3	9
Patients Leaving after 1 Year or More ..	1	10	11	22

No significant relationship was found between the treatment used and the social class distribution, though there was a discernible trend for the lower social classes to have a higher proportion of cases given no systematic treatment. Similarly, when the condition at discharge was considered, there was no significant excess of "Not Improved" patients in Classes IV and V, although the number in this category was in excess of the expected frequency.

To recapitulate, while patients in lower social classes have on average been longer in hospital and show a tendency towards a less satisfactory clinical condition at discharge, neither of these factors is sufficiently marked to be regarded as of major importance in determining the later outcome.

MEASUREMENT OF OUTCOME.—Three main points were considered: the success or failure of rehabilitation, the readmission rate, and the total time spent in hospital in the ensuing 2 years.

(*a*) *Success or Failure of Rehabilitation.* — The success or failure of the patient's first year after discharge is of considerable importance to the long-term prognosis. It is during this time that he attempts, with the aid of medical and social supervision, to return to normal life in the community and to gainful employment. If he is successful he will be fortified against the onset of further attacks; his own self-confidence, and the confidence of others in him, will be restored, and he will be accepted once more as a normal person. On the other hand, failure to make a readjustment will discourage the patient, engender a pessimistic attitude towards his future, and confirm those about him in the belief that he is irretrievably damaged. Of all patients who relapse the highest percentage do so in the first year.

In the present study, "success" was defined as "successful return to gainful employment as shown by being in work for at least 6 of the first 12 months after discharge". All patients who did not fulfil this criterion were classed as "failures", together with those who were readmitted to a mental hospital for a total of more than one month during the 12 months after discharge. These criteria were found to be closely correlated with social class (Table III).

TABLE III

SUCCESS OR FAILURE OF REHABILITATION, BY SOCIAL CLASS

Rehabilitation	Social Class			
	I and II	III	IV and V	Total
Success	16	80	33	129
Failure	4	28	31	63

$\chi^2 = 10{\cdot}13$; $d.f. = 2$; $p < 0{\cdot}01$

This finding is important and merits further analysis. From the criteria employed it might be due entirely to a larger number of readmissions among the lower social classes. This is not so, however; if we consider only those patients who were not re-admitted in the first year, the "failure" rate is still related to social status (Table IV).

TABLE IV

SUCCESS OR FAILURE OF PATIENTS NOT READMITTED IN FIRST YEAR AFTER DISCHARGE, BY SOCIAL CLASS

Rehabilitation	Social Class			
	I and II	III	IV and V	Total
Success	16	77	32	125
Failure	2	9	13	24

$\chi^2 = 7{\cdot}99$; $d.f. = 1$; $p < 0{\cdot}01$

The professional man or skilled worker usually has less difficulty in returning to employment. He tends to hold the same job for a long time; usually he is paying into a superannuation fund, and he stands to gain by retaining his position. When he falls ill his place may be kept for him, if necessary for several months. Alternatively, if he has to seek a new post, his skill and qualifications may make this relatively easy.

The unskilled man, however, usually has no such advantages. He is expendable, and can be paid off on the spot. Generally speaking, the work he has been doing can be done by any other able-bodied man in search of work. When he emerges from hospital, he has less chance of being taken back by the same firm, and no qualifications to recommend him to a prospective new employer. He must have the perseverance to attend the local Labour Exchange and to travel to any place where he is told that work is available. He may find that he can live his restricted life as well on unemployment benefit and "National Assistance", as by doing the poorly-paid, possibly unpleasant, work which is all he can obtain. Thus, while patients in upper and middle social classes tend to return to their former occupations, those of lower status tend to move into a new trade, or to drift into chronic unemployment.

To test this hypothesis, all patients in the series were placed in one of three categories:

(1) Those who returned after discharge to the occupation they had held before admission. (This did not necessarily mean with the same employer, but to the same classified occupation.) Unskilled labourers who returned to the same *trade* were included in this category (*e.g.* building, the docks, catering, etc.).

(2) Those who returned to a different occupation, or for unskilled men to a different trade.

(3) Those who failed to return to gainful employment within 12 months of discharge. A patient was not classed as having returned to gainful occupation unless he had been continuously in work for 3 months or more.

These three categories are compared with the social class distribution in Table V, which shows a positive correlation between social class and return to employment, so confirming the hypothesis stated.

TABLE V

DISCHARGED PATIENTS' RETURN TO EMPLOYMENT, BY SOCIAL CLASS

Occupation	Social Class			
	I and II	III	IV and V	Total
Same	14	62	22	98
Different	2	30	17	49
No Gainful Occupation	4	16	25	45

$\chi^2 = 17{\cdot}744$; $d.f. = 4$; $p < 0{\cdot}02$

It may be said, therefore, that the schizophrenic patient's prognosis, so far as resettlement is concerned, is closely linked to his social class.

(*b*) *Readmission Rate.* — The question of re-admission in the first year after discharge has been mentioned already, in discussing the criteria for "success" and "failure". Patients who "failed" were not, however, identical with those readmitted, and the latter are now considered separately. Since the follow-up survey covered a minimum period of 2 years for every patient, the readmission rate was established for both the first year and the first 2 years after discharge (Table VI, opposite). The total time spent in a mental hospital by each patient during the 2 years was also calculated, and from this the mean total length of stay could be obtained for each social class (Table VI). The readmission rate in both the first 12 months and the whole 2 years, shows a tendency to increase steadily throughout the social class gradient. The percentage of readmissions is below average for Classes I to III and above average for Classes IV and V for both periods. When these differences are evaluated by use of contingency tables, no significant correlation is found. (For the first year, $\chi^2 = 3{\cdot}997$; $d.f. = 2$; $p > 0{\cdot}05$, and for the 2-year period, $\chi^2 = 2{\cdot}871$; $d.f. = 2$; $p > 0{\cdot}05$.)

TABLE VI

READMISSION RATE AND TOTAL TIME SPENT IN HOSPITAL, BY SOCIAL CLASS

Readmission		Social Class			
		I and II	III	IV and V	Total
In First Year	No.	2	22	19	43
	Per cent.	10·0	20·2	29·7	22·4
Within 2 Years	No.	4	33	25	62
	Per cent.	20·0	30·5	39·1	32·3
Mean Total Time in Hospital in 2 Years (mths)		0·47	2·42	4·08	2·77

(*c*) *Time Spent in Hospital.*—When the mean total stay in hospital is considered, a much bigger disparity between the social classes can be observed. Not only has the lower group an above-average time, and the other groups below-average times, but the mean total time for Classes IV and V is approximately nine times greater than that for Classes I and II.

The amount of time spent in hospital is an important prognostic index. Harris, Linker, Norris, and Shepherd (1956) found that the total duration of stay in hospital for their group of schizophrenic patients was closely correlated with the patients' condition at follow-up (after 5 years), and they concluded that statistical studies, in which prognosis is assessed by duration of stay, give a reliable assessment of outcome. If this is so, it is one more reason to suppose that prognosis is directly related to social class. That the time spent in hospital during the first 2 years is a significant pointer to subsequent progress, can be confirmed by considering the group of patients discharged in 1953 and 1954 for whom the follow-up period extended over at least 4 years. The distribution of the 67 cases in this group are shown in Table VII, where the disparity between the classes is even more marked than in Table VI, the mean time for Classes IV and V being approximately fifteen times greater than that for Classes I and II.

TABLE VII

TIME SPENT IN HOSPITAL IN 4 YEARS FROM DISCHARGE, BY SOCIAL CLASS

Social Class	I and II	III	IV and V	Total
Number of Cases	10	36	21	67
Mean Total Time in Hospital in 4 Years (mths)	0·64	4·70	9·65	5·2

It seems likely that the worse outcome for the lower class patient becomes increasingly marked as time goes on. The *number* of admissions to hospital of such patients is not greater, but individual admissions lead to longer stays in hospital; the upper class patients tend to have several comparatively short spells in hospital, but the lower class patients tend to stay in hospital longer, and may become chronic institutional cases after the second or third admission. As we have seen already, the low status patient runs a greater risk than the more privileged patient of becoming a chronic case even during his first admission, and this points to the fact that his prognosis is consistently less favourable from the first admission onward.

CONDITION AT FOLLOW-UP.—The next step was to examine the patient's current social, economic, and psychiatric condition at the time of the follow-up survey, and to see whether this was related to social class. To do this, three ratings were made, and these were first analysed separately, and were then combined to give a general assessment of his social adjustment.

(1) *Economic Status.*—The patient was placed in one of three categories (Table VIII):

(*a*) Supporting himself entirely, and possibly others of the household as well, during the greater part of the previous 12 months.

(*b*) Working intermittently or part-time, but to some extent dependent financially upon his relatives, or on some form of assistance such as National Health Insurance, unemployment benefit, or National Assistance grant.

(*c*) Unemployed and completely dependent financially on relatives or public money. This included patients currently in a mental hospital.

TABLE VIII

ECONOMIC STATUS AT FOLLOW-UP, BY SOCIAL CLASS

Economic Status		Social Class			
		I and II	III	IV and V	Total
Self-supporting	No.	16	76	28	120
	Per cent.	80·0	70·4	43·7	62·5
Partly Dependent	No.	0	5	2	7
	Per cent.	0·0	4·6	3·2	3·6
Completely Dependent	No.	4	27	34	65
	Per cent.	20·0	25	53·1	33·9

Information was obtained at interview and the appropriate category was marked on the interview schedule. The patient was also given a rating of 2, 1, or 0, corresponding to the three categories. The number of "partly dependent" persons being small, they were included with the "completely dependent", in constructing a contingency table. This showed a highly significant correlation ($\chi^2 = 15 \cdot 283$; $d.f. = 2$; $p < 0 \cdot 01$). In other words, at a given point from 2 to 7 years after first discharge, over one half of the lower status patients were completely dependent, as compared with not more than one quarter of other patients.

(2) *Social Liability.*—An assessment was made of the patient's behaviour and attitudes, and the amount of inconvenience or hardship caused to others. This assessment was based partly on the patient's own statements and the general impression gained from talking to him, but more on the evidence of his relatives or other members of the household. For patients currently in hospital at the time of the survey, the assessment was based on the medical notes and the reports of the nursing staff caring for him. Three categories were employed (Table IX):

(*a*) Behaving normally, restored to pre-morbid personality, or at worst displaying only mild residual personality changes.

(*b*) Suffering from persistent or recurring psychotic symptoms, but not grossly disturbed in behaviour, and able to maintain interpersonal relationships to a reasonable degree.

(*c*) Showing gross behaviour disturbances because of persistent or recurring psychotic symptoms, and unable to maintain interpersonal relationships.

TABLE IX

SOCIAL LIABILITY AT FOLLOW-UP, BY SOCIAL CLASS

Liability		Social Class			
		I and II	III	IV and V	Total
Normal Personality, or Mild Changes only	No.	10	52	20	82
	Per cent.	50·0	48·1	31·2	42·8
Persisting Symptoms Without Gross Disturbance	No.	8	47	29	84
	Per cent.	40·0	43·5	45·4	43·8
Grossly Disturbed Behaviour and Relationships	No.	2	9	15	26
	Per cent.	10·0	8·4	23·4	13·4

The patient was given a rating of 2, 1, or 0 corresponding to the three categories. No formal list was made of the symptoms or behaviour to be included in these categories, but a subjective judgment was made for each individual. In practice, physical violence, destructiveness, impulsive outbursts, attacks of shouting and cursing, accusations directed at others, suicidal threats or attempts, and sexual misdemeanours, were placed in category (*c*), and hallucinosis and paranoid delusions not resulting in disturbed conduct, together with suspiciousness, solitary habits, loss of outside interests, and minor eccentricities, were included in category (*b*). Table IX shows that over half the patients continued to show a moderate or severe mental abnormality. The proportion is in excess of the expected in Social Class IV and V, and less than expected in the other classes. If categories (*b*) and (*c*) are combined to form a contingency table, the correlation is significantly positive ($\chi^2 = 6 \cdot 18$; $d.f. = 2$; $p < 0 \cdot 05$).

The lower economic status of the lower class patients is therefore to some extent related to their mental condition, and it may be that the patient who has made a good clinical recovery stands a good chance of re-establishing himself, whatever his social level. But it seems most likely that clinical condition and economic status are mutually related and interacting, and that the patient who fails to return to useful work is more prone to schizophrenic relapses. Moreover, the figures suggest that a mentally disturbed patient in the lower classes is much less likely to be able to earn his living, than a middle or upper class patient. Thus, in the Classes I and II, 30 per cent. of self-supporting patients were mentally disturbed; in Class III 22·3 per cent., and in Classes IV and V only 12·5 per cent. This points to the fact that, contrary to a commonly-held belief, schizophrenia is more disabling for those in unskilled occupations.

(3) *Self-Care.*—This was rated separately from "social liability" because it was thought that the two might not be closely related. A well-preserved paranoid individual might be eminently capable of looking after himself, yet cause serious social disturbance; while a chronic schizophrenic of the simple type might need a good deal of supervision, yet still be accepted by his family as docile and harmless.

Three categories were employed (Table X, opposite):

(*a*) A fairly normal standard of self-care, needing no help or direction as regards personal appearance, dress, toilet, and use of money.

(*b*) Slovenly, apathetic, or withdrawn, requiring some supervision and occasional help with appearance, toilet, or use of money.

TABLE X

STANDARD OF SELF-CARE, BY SOCIAL CLASS

Self-Care	Social Class			
	I and II	III	IV and V	Total
No Supervision of Appearance, Toilet, or Use of Money ..	15	94	39	148
Some Supervision of Appearance, Toilet, or Use of Money ..	4	12	22	38
Considerable Help with Dress, Toilet, or Use of Money	1	2	3	6

$\chi^2 = 14{\cdot}618$; $d.f. = 2$; $p < 0{\cdot}01$

(*c*) Incapable of self-care through persistent mental illness, and needing considerable help with dress, toilet, and the handling of money.

Each patient was rated 2, 1, or 0, according to the degree of self-care displayed.

Table X shows that the standard of self-care is directly related to the social class gradient.

It is interesting to note how few of the patients studied, including those currently in mental hospital, needed considerable help in self-care and management; this is a reflection of the changing pattern both of schizophrenia and of the mental hospital chronic wards.

(4) *Social Adjustment.*—The ratings obtained for economic status, social liability, and self-care were combined to give a total "Social Adjustment" score (Table XI). This varied from a possible maximum of six points to a possible minimum of no points. Patients with five or six points were classed as having a "good" level; patients with three or four points as having a "fair" level; and patients with one, two, or no points as having a "poor" level. There is a significant correlation between level of social adjustment and the social class gradient ($\chi^2 = 16{\cdot}29$; $d.f. = 2$; $p < 0{\cdot}01$).

TABLE XI

LEVEL OF SOCIAL ADJUSTMENT, BY SOCIAL CLASS

Level of Social Adjustment	Social Class			
	I and II	III	IV and V	Total
Good	14	70	28	112
Fair	3	25	12	40
Poor	3	13	24	40

These findings seem to confirm the hypothesis that the outcome of schizophrenic illness at the end of a given follow-up period will be worse for those of lower social status, and that this is related to earlier prognostic indices, such as the length of time spent in hospital and the degree of success in returning to employment following discharge.

How do these results conform with the ecological theories of schizophrenia already discussed? We have seen that, so far as formal treatment methods are concerned, there was no great variation with social status; nor did the frequency of psychiatric follow-up vary with social class (this is also true for the present series). Whatever is responsible for the worse plight of the lower status patients, it does not appear to be primarily a difference in medical treatment. The chief reason for this is probably that only a small proportion of patients in any class were currently receiving psychiatric supervision (which was taken to include attendance at the follow-up clinics, the general hospital out-patient clinics, and the two day-hospital units available). Of a total of 110 cases found to have persisting moderate or severe disturbance of behaviour and personality, 31 were in hospital, and only 29 under out-patient supervision.

The hypothesis of schizophrenic "drift" and "downward social mobility" can now be re-examined. The first postulates that the high incidence of schizophrenia in certain areas is due to a migration of pre-schizophrenic individuals into those areas; the second that the high incidence of schizophrenia in the lower social classes is due to a downward occupational drift of the pre-schizophrenic individual. If these processes occur, it seems improbable that they will be halted after a first admission to hospital. Schizophrenia is a chronic or recurrent illness in most cases, and this is certainly true for the present series as a whole; as has been seen, nearly 60 per cent. of cases still showed clear evidence of abnormality at the time of follow-up. One might therefore expect those who at first admission still maintained their original place in the class-structure, to have drifted downwards subsequently, and to have done as badly in the long run as those already in a low class at the onset of frank psychosis. So far, however, the results tend to show that the upper class patients maintain their superiority, and in general carry a better prognosis. In an attempt to gain more evidence on this point, an examination was made of the "occupational deterioration" of the patients followed-up in this study. This was done by comparing each patient's social class before his first admission to hospital, with his current social class at the time of the survey, as based on his present occupation (Table XII). In addition to the Registrar General's five social

classes, a sixth class, "Not Gainfully Occupied", was distinguished; this included patients currently in a mental hospital, or completely dependent financially on their family or on the community. The percentages shown in brackets include the proportion of patients in each social class who retained the same status throughout the period of follow-up.

TABLE XII

COMPARISON OF SOCIAL CLASS BEFORE FIRST ADMISSION AND AT FOLLOW-UP

Social Class at Follow-up	Social Class before First Admission			
	I and II	III	IV	V
I and II ..	15 (75·0 per cent.)	1	—	—
III	1	62 (57·4 per cent.)	2	—
IV	—	9	5 (26·3 per cent.)	1
V	—	9	5	17 (37·8 per cent.)
Not Gainfully Occupied ..	4	27	7	27

From Table XII a number of inferences may be drawn. To begin with, there is a degree of "downward social mobility" in the patient sample; 89 patients have dropped to a lower social class, and 65 of these are classed as "not gainfully occupied", while the remaining 24 are doing a less skillful type of work than before their illness.

Secondly, there is very little "upward social mobility"; only four patients showed an improvement in social status, each having moved up one class. This does not correspond to the idea of schizophrenics as "achievers" and "over-achievers", although it does not preclude an initial rise in social class before the onset of the psychosis, which has been followed by a subsequent fall.

Thirdly, the majority of patients who drop from the original social class become "not gainfully occupied"; in other words, if a patient is too ill to maintain his previous level, he will probably not be able to work at all. Comparatively few had made a satisfactory adjustment in a less skilled occupation. Thus, of the original members of Classes I and II, one had dropped to social class III, and four were "not gainfully occupied".

Fourthly, the higher the patient's original social status, the better his chances of maintaining it. The Class IV and V patients were much the most vulnerable in this respect, and of the Class V cases in particular, over half had become "not gainfully occupied".

While there is, therefore, a certain degree of "downward social mobility" among these patients, it does not seem to be the most important factor in the observed social class gradient of schizophrenia. The only satisfactory explanation for the consistently worse outcome of the lower class patients is that contained in the third ecological hypothesis, namely, that they are subjected to some form of increased socio-economic stress: if this explains the differential outcome of the illness, it seems probable that it also does much to determine its incidence.

TYPE OF LIVING-GROUP.—In the analysis of the admission series, the role of "Social Isolation" was discussed, and it was suggested that, while this was rather an over-simplification of a vague concept, the patient's having been in or out of his family setting gave a practical criterion of isolation. Whether the same factor of social isolation continues to play an unfavourable part in the schizophrenic's subsequent progress is undetermined. Brown and others (1958) found some evidence to suggest that the long-stay schizophrenics who went out of hospital to lodgings, or to other kin, did better than those who went to wives or to hospitals, while the patients who went to their parents did worst of all. These authors suggest that this fact may be related to the well-recognized phenomenon of the over-protective mother of the schizophrenic. If this is so, it would appear to be somewhat opposed to the "social isolation" hypothesis. On the other hand, Mettler, Crandell, Wittenborn, Litten, Feiring, and Carpenter (1954), in trying to assess the prognosis of schizophrenic patients who were candidates for psychosurgery, found that extramural environmental factors after discharge were of very little significance, except for a small number of the less favourable cases, who seemed to do better with extra-familial placement.

To check the effect on the present series, if any, of the type of living group to which patients were discharged, this was compared with two of the criteria of outcome already described: readmission to a mental hospital during the follow-up period, and economic status at the time of the survey. Four types of living group were distinguished: parental home, marital home, residence with any relatives other than parents or wife, and residence alone or

in lodgings (none of the patients in this survey were discharged to any kind of after-care hostel or long-stay annexe). The results for the two criteria of outcome are shown in Table XIII, where "in work" is taken to mean in full-time employment for over half of the previous 12 months.

TABLE XIII

OUTCOME ASSESSED BY TYPE OF LIVING GROUP

Result at Follow-up		Type of Living Group				
		Parents	Spouse	Other Kin	Alone or in Lodgings	Total
Readmitted within 2 Years	No. ..	38	13	6	5	62
	Per cent.	36·9	23·2	30·0	38·5	
Not Readmitted	No. ..	65	43	14	8	130
	Per cent.	63·1	76·8	70·0	61·5	
In Work	No. ..	57	45	13	5	120
	Per cent.	55·3	80·4	65·0	38·5	
Not in Work	No. ..	46	11	7	8	72
	Per cent.	44·7	19·6	35·0	61·5	

For both criteria the order of outcome is the same; married men returning to their wives did best; those returning to other relatives came next; patients discharged to their parents did less well, and not much better than the least successful group of all, those discharged to live alone or in lodgings.

These results, taken alone, are not meaningful, since they do not take into consideration the relative ages of the different groups, and the differences in clinical condition at discharge. Thus, patients going to their parents were younger on average than those going to their wives, and a rather higher proportion of patients who were "not improved" went to parental homes. Moreover, the total number of patients who went to lodgings is small (thirteen only, compared with the thirty patients in the admission series who were noted as "out of family setting"). This is possibly due to the fact that patients with no relatives have a comparatively poor chance of discharge. As far as they go, however, the figures are consistent with both the hypotheses already mentioned: that patients going to live alone suffer from the effects of "social isolation", and that those returning to the parental home may be unfavourably affected by parental "over-protection".

The type of living group was next compared with the patient's social class (Table XIV). The only significant feature is the preponderance of lower class patients in those living alone or in lodgings. This confirms the finding for the admission series, that lower class status and "social isolation" are positively related. Apart from this, there is a tendency for lower class patients to go to their parents rather more frequently, and for upper class patients to go to wives or "other relatives" more frequently, this being associated with a more favourable prognosis.

TABLE XIV

TYPE OF LIVING GROUP, BY SOCIAL CLASS

Type of Living Group		Social Class			
		I and II	III	IV and V	Total
Parents	No. ..	9	60	34	103
	Per cent.	45·0	55·6	53·2	
Spouse	No. ..	7	34	15	56
	Per cent.	35·0	31·0	23·4	
Other Kin	No. ..	4	8	8	20
	Per cent.	20·0	7·4	12·5	
Alone or in Lodgings	No. ..	0	6	7	13
	Per cent.	0·0	5·5	10·9	

CONCLUSIONS

(1) Distribution of age at discharge, and of marital status, was not related to the social class gradient in this series of patients.

(2) There was no significant class distribution of the types of treatment which these patients had received in hospital.

(3) The length of stay in hospital before first discharge *was* related to social class, but the number of long-stay patients was small, and this could not be regarded as an important prognostic factor.

(4) There was a significant relation between social class and success or failure of rehabilitation in the first year after discharge.

(5) There was also a significant relation between social class and return to former occupation.

(6) Social class did not significantly affect a patient's likelihood of readmission within the follow-up period, but it did considerably affect the total amount of time spent in hospital.

(7) The level of social adjustment at the time of follow-up, as measured by his economic status, effect on his relatives, and standard of self-care, was significantly related to social class.

(8) Psychiatric follow-up and supervision since discharge did not appear to affect the outcome.

(9) The findings favoured the hypothesis that an increased socio-economic stress is exerted on those in the lower social classes. This stress is related to, but not identical with, "social isolation".

(10) The findings suggest that schizophrenic "drift" plays a positive, but relatively minor, role in the ecology of schizophrenia, and that occupational deterioration is most severe for patients who were originally of low occupational status.

(11) While the type of living group to which the patient is discharged appears to be of some importance in prognosis, this was not related to the social class distribution of the follow-up series, except that the small group of patients living out of family setting were predominantly of lower social status.

Discussion

It has been noted that, while a large number of prognostic factors are recognized in schizophrenia, those concerned with the patient's socio-economic status have been touched on in rather general terms. They may now, however, be formulated more precisely:

Prognosis in schizophrenia is directly related to social status. Patients from the upper social classes, with high occupational prestige and good employment records, carry a good prognosis; conversely, patients from the lower social classes, with low occupational prestige and poor employment records, have a correspondingly bad prognosis. Furthermore, prognosis is related to the patient's domestic circumstances. Those who before their illness have been living in a family-group environment, and those who after treatment return to such a group, tend to have a good outcome; conversely, those who have been living out of the family-group, and those who after treatment do not return to the family-group, have a correspondingly bad outcome.

The conclusions drawn from this investigation seem to favour the hypothesis that conditions of socio-economic stress, suffered most by those in the lower social classes, are important in the genesis of schizophrenia. Comparatively little evidence was found of a downward social drift in the patients under survey; on the contrary, the findings seemed to indicate that patients who had reached a moderately high occupational level before their illness tended to remain at that level, and that it was those who had low occupational prestige who suffered the most severe disability. This confirms the findings of Hollingshead and Redlich (1958) and other investigators: it is the under-privileged, the indigenous poor, who are worst affected by this malady. That section of the community which provides the highest proportion of cases, is least able to make an adequate adjustment to the disease, once established (Adler, 1956). This does not preclude the possible significance of inter-generation social mobility. It may be that the lower class patients studied in this investigation owed their inferior status at least in part to genetic factors, or to early developmental influences, which determined their personalities, hence the pattern of their low educational attainments and subsequent poor occupational records. As has been said, the question whether such inter-generation social mobility is greater than average in the families of schizophrenics remains unsettled, and the evidence to date is contradictory. What can be affirmed is that, in the patients' own generation, the cardinal factor is not a downward occupational drift, but their original position in the social order.

Ignorance, poverty, rootlessness, lack of tradition, and absence of pride in skilled work are all implicated in the causation of mental illness, for they leave the individual defenceless against its onset. The securing of an accepted role in the community is essential for the mental health of every person, and it has been said that the failure of our society to provide adequately for such roles is the most important single factor in mental disorder (Burgess, 1956). If mental disorder is produced by social stress acting upon those who are predisposed, it is liable to be maintained and aggravated by the same cause. It is impossible adequately to convey the nature of this stress by a single phrase and the attempt to do so leads to over-simplification. Two related factors have however been identified: low occupational prestige and social isolation. There is still a large section of the community to which modern concepts of mental illness and mental health have not penetrated. The outcome of mental disorder may depend upon early diagnosis and treatment, and for this reason the patient's path to psychiatric treatment should be made as short and painless as possible. Among the lower strata of our society, mental illness is still too often regarded with dread or with ridicule, and the psychiatrist with suspicion. More educational measures are needed to spread enlightened concepts of mental health to every part of society. But these

will not be successful unless the Mental Health Service provided can justify the confidence for which we ask. The inculcation of a new attitude to psychiatric treatment depends upon the relationship established between the psychiatric service and the patients who come under its care (W.H.O., 1959).

Much can be done to combat the harmful effect upon the patient of low occupational prestige. Rehabilitation in the true sense begins when the patient begins treatment and a great deal can be achieved in the hospital environment, once the acute stage of illness has been passed, to inculcate good social attitudes and regular habits of work. The development of occupational therapy, and in recent years of "industrial therapy" for the more chronic type of patient (Carstairs, O'Connor, and Rawnsley, 1956; Collins, Manners, Flynn, and Morgan, 1959), provides opportunity for preparing the schizophrenic patient for his return to the community. Moreover, patients who are sufficiently recovered, and who are considered to be in need of more active rehabilitation, may be referred to a Ministry of Labour Industrial Rehabilitation Unit, and thence possibly to a Government Training Centre; and there is evidence that such a rehabilitation course may have a beneficial effect upon the patient's clinical condition (Wing and Giddens, 1959). The provision of more training facilities, and of sheltered workshops, as well as a better liaison both with the Ministry of Labour and with private industry, is needed to ensure the return of the schizophrenic to useful employment. Once the schizophrenic patient, of whatever social status, can return to a community which has not forgotten him and offers him a socially useful role, his prognosis will be greatly improved.

Psychiatrists can do a great deal to bring this about, but in the long run the attitude of society as a whole is involved. The economic structure must continue to rely to some extent upon semi-skilled and unskilled labour, but social prestige should not be reserved for those of high ability and technical skill; all serve the community, and the less skilled worker is entitled to an accepted social role (Glass, 1954).

The present study is a small one. It needs reduplication and extension, on a larger scale and in other parts of Great Britain. If its findings are substantially confirmed, it may make some contribution to our knowledge of the ecology of schizophrenia, and may help to provide a theoretical basis for future community programmes of treatment and prophylaxis.

SUMMARY

(1) The relationship between social class and outcome of schizophrenic illness was studied in 192 male patients discharged from their first stay in a mental hospital, over a 5-year period.

(2) Several measures of outcome were found to be related to social class: these included success or failure of rehabilitation, total time spent in a mental hospital in subsequent years, and social and economic status at follow-up.

(3) The various hypotheses for the class-distribution of schizophrenia are discussed in the light of these results.

(4) The implications for a programme of social psychiatry are discussed.

I wish to thank Dr. R. E. Hemphill, Medical Superintendent, for permission to carry out this work; Mrs. R. Somers for invaluable assistance with the case work; Mr. R. G. Greenslade, Records Officer, for help wtih the case records; Mrs. V. York for assistance with the manuscripts.

REFERENCES

Adler, L. McK. (1956). *In* "Mental Health and Mental Disorder", ed. A. M. Rose and others, p. 501. Routledge and Kegan Paul, London.

Brown, G. W., Carstairs, G. M., and Topping, G. (1958). *Lancet*, **2**, 685.

Burgess, E. W. (1956). *In* "Mental Health and Mental Disorder", ed. A. M. Rose and others, p. 3. Routledge and Kegan Paul, London.

Carstairs, G. M., O'Connor, N., and Rawnsley, K. (1956). *Brit. J. prev. soc. Med.*, **10**, 136.

Collins, S. D., Manners, F., Fynn, S. J., and Morgan, R. (1959). *Lancet*, **2**, 609.

Glass, D. V. (1954). "Social Morbidity in Britain". Routledge and Kegan Paul, London.

General Register Office (1951). "Classification of Occupations, 1950". H.M.S.O., London.

Harris, A., Linker, I., Norris, V., and Shepherd, M. (1956). *Brit. J. prev. soc. Med.*, **10**, 107.

Hollingshead, A. B., and Redlich, F. C. (1958). "Social Class and Mental Illness". Wiley, New York.

Mettler, F. A., Crandell, A., Wittenborn, J. R., Litten, K., Feiring, E. H., and Carpenter, M. B. (1954). *Psychiat. Quart.*, **28**, 549.

Wing, J. K., and Giddens, R. G. T. (1959). *Lancet*, **2**, 505.

World Health Organization (1949). "Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death". W.H.O., Geneva.

—— (1959). "Social Psychiatry and Community Attitudes: Seventh Report of the Expert Committee on Mental Health", *Wld Hlth Org. techn. Rep. Ser.*, No. 177. W.H.O., Geneva.

Brit. J. prev. soc. Med. (1961), **15**, 42–47

PROSTITUTION AND VENEREAL DISEASE

SOCIAL CONSIDERATIONS OF PROSTITUTION*

BY

R. R. WILLCOX

St. Mary's Hospital, London, and King Edward VII Hospital, Windsor

In an earlier paper (Willcox, 1960) it was shown that prostitutes in Asia are heavily infected with venereal disease, and in a second paper (Willcox, 1961) the proportion of venereal disease in the general population which was caught from prostitutes in a number of Asian countries is contrasted with the situation in France, the United Kingdom, and the United States of America. In Asia most venereal infections are contracted from prostitutes whereas in the other countries listed, this is not so, the professional prostitute having been largely replaced by the "good-time girl".

In the present paper various social factors relating to prostitution are considered.

Kinsey, Pomeroy, and Martin (1948) noted that the world's literature contained hundreds of volumes attempting to assay the social significance of prostitution: "For an activity which contributes no more than it does to the sexual outlet of the American male population, it is amazing that it should have been given such widespread consideration".

Prostitution is but one of several means by which the venereal diseases are spread. Freed (1953) indicated that the incidence of these diseases varied inversely to the proportion of married persons in the population, and directly with the proportion of young adults in a community, the degree of disparity of the sex ratio, racial heterogeneity (especially where racial heterogeneity and socio-economic differentiation are synonymous terms), economic stratification, illiteracy, horizontal social mobility, urbanization, prostitution, and social disorganization of the population, such as may be caused by war.

Prostitution is obviously therefore only one factor in the spread of venereal diseases, and its elimination, although it may reduce their incidence, will certainly not lead to their complete disappearance.

The Itinerant Male

The bulk of venereal disease is contracted and transmitted by the itinerant male and the promiscuous static female. The itinerant male may be a seaman or a soldier in a land far from home, or a native on a temporary visit to the capital or some other city. These persons, by the nature of their temporary domicile, are more likely to consort with prostitutes than with other women, and prostitutes are mainly to be found just in the areas in which itinerants abound.

Seamen.—Numerous authors, including Gudmundsson (1956), Häro and Pätiälä (1954), Willcox (1954), Hermans (1954), and many others, have stressed the relatively high incidence of venereal diseases in seamen. They featured prominently in a series of 878 cases of venereal disease reported by Tottie (1949) in Sweden. Almost half had been infected by prostitutes, and the seamen comprised 40 per cent. of all cases thus infected.

In Oslo in 1954–1955 about 15 per cent. of all reported cases of venereal disease were in seamen (Gjessing, 1956). Finnish sailors have a gonorrhoea incidence of 74 per 1,000 per annum, a figure almost identical with that for sea-going personnel in the U.S. Navy (1954). How they acquire the infection depends on the social pattern of the country visited. Stuart and Joyce (1954), in an analysis of 4,364 sex contacts of 2,426 American seamen in ports throughout the world (80·5 per cent. had gonorrhoea), noted that 52·2 per cent. of the contacts in the United States were of the "pick-up no fee' type, which was also the dominant type in Europe. In most other areas, however, more than 50 per cent. of the contacts were house prostitutes.

* Prepared for W.H.O. Venereal Disease Seminar, Tokyo, March, 1958. Paper adapted from material in "The Role of Prostitution in the Spread of Venereal Disease", *U.N. International Review of Criminal Policy* (Willcox, 1957).

Figures concerning the source of venereal infections in United States Navy personnel in 1951* show that, of 36,343 venereal infections incurred throughout the world, 58·8 per cent. were contracted from prostitutes. The percentages by areas were 50·5 for U.S. overseas territories and possessions, 88 per cent. elsewhere in the Americas, 43·5 per cent. for Europe, and 87·1 per cent. for the Far East. The lowest percentage (9·1) was for the British Isles—which was even lower than the 11·9 per cent. for the continental United States.

Itinerants in England and Wales.—Using the 1951 Census as a basis (General Register Office, 1952), it was estimated that, of the working population of 16,018,700 males aged 15 and over in England and Wales as a whole, 2,152,800 (13·4 per cent.) were in occupations classified as itinerant. The importance of the male itinerant in the spread of venereal disease was well brought out by the gonorrhoea study of the British Co-operative Clinical Group (1956). When the male gonorrhoea patients in itinerant occupations (including seamen, commercial travellers, showmen and actors, tourists, soldiers, etc.) were compared with those in static occupations (professional men, clerks, shop assistants, artisans, labourers, domestics, etc.), 33·9 per cent. of patients were found to be itinerants as against 13·4 per cent. in the population as a whole.

The proportion of itinerant males was highest in the ports and in London than in the inland cities and rural areas, and this distribution coincided with the distribution of prostitutes (Table I).

TABLE I

OCCUPATION OF MALE GONORRHOEA PATIENTS, UNITED KINGDOM, 1954
(British Co-operative Clinical Group, 1956)

Area	Seaports and London	Inland Cities and Rural Areas	Total
Total Cases	4,927	1,077	6,004
Itinerants	1,848	189	2,037
Per cent. Itinerants	37·5	17·6	33·9
Per cent. Infections by Prostitutes	38·4	15·7	35·7
Per cent. Infections by Unpaid Casual Acquaintances ..	39·3	57·8	41·5

Seamen accounted for 1,278 of the 6,004 male cases (21·3 per cent.). Nicol (1956), analysing the British material further, found that prostitutes were responsible for no less than 68 per cent. of the seamen's infections, but for only 32 per cent. of infections in men in other occupations.

Immigrants.—Of the total of 6,004 male patients, only 3,752 (62·5 per cent.) were natives of the United Kingdom. 1,003 patients (37·5 per cent.) were white immigrants (878 from Europe), 878 were Negro immigrants (mainly from West Africa and the West Indies) who in recent years have been coming to Britain in increasing numbers, and 371 were immigrants from other areas.

In the United States agricultural migrants have recently been shown to be important potential disseminators of venereal disease (Shepard and Page, 1954).

THE STATIC FEMALE

In the gonorrhoea study of the British Co-operative Clinical Group (1956) only 0·5 per cent. of female gonorrhoea patients were itinerants, whereas, according to the 1951 Census, 1 per cent. of the female working population aged 15 years and over were employed in occupations classified as itinerant. Of the male patients only 62·5 per cent. were natives of the United Kingdom, but for the females the proportion was 91·2 per cent.

Prostitutes (in spite of the so-called "white-slave traffic"—or possibly partly because of its suppression) are recruited without difficulty from the natives of the country concerned (Table II, opposite).

There are, of course, some exceptions. In the Lebanon (Table II) there are reported to be many prostitutes from neighbouring Syria and Israel, all but one of the non-Lebanese listed being from one of these two countries. Pereira (1956) stated that most of the prostitutes in the brothels of Laos were not native-born but came from Vietnam or Cambodia, and that of some 290 clandestine prostitutes in the three principal towns approximately 130 came from Siam, Cambodia, or Saigon.

By and large, however, these figures indicate that any large-scale "traffic in women and children" has been virtually stopped and that principal responsibility for women in brothels rests with each particular country.

ECONOMIC AND POLITICAL FACTORS

That both the prevalence of venereal diseases and prostitution are geared to socio-economic conditions has been indicated by many writers (*e.g.* Guthe and

* Kindly provided by the Public Health Service of the U.S. Department of Health, Education, and Welfare.

TABLE II
COUNTRY OF ORIGIN OF PROSTITUTES

Country	Year	Type of Prostitute	Source	Total	Foreigners	Nationals	Per cent. Nationals
Austria	1948–50	Brothels	UN, 1952	78	4	74	96·0
	1951	Vienna: supervised	UN, 1952	568	29	539	94·9
Egypt	1948–49	Brothels	UN, 1952	961	42	919	95·6
France	1946	Brothels	UN, 1948	4,840	19	4,821	99·6
Greece	1950	Brothels and clandestine	UN, 1952	984	—	984	100·0
India	1948–50	Delhi: brothels	UN, 1953	549	19	530	96·5
	1948–50	Hyderabad: clandestine	UN, 1953	350	—	350	100·0
Iraq	1948–50	Brothels	UN, 1953	622	—	622	100·0
Lebanon	1948–50	Brothels	UN, 1953	551	241	301	54·6
Malaya	1955	"Coffee shops"	Holmes, 1955	45	3	42	93·3
Philippines	1950	Vagrants	Lozano, 1951	1,028	6	1,022	99·4
Portugal	1947–48	"Furnished rooms"	UN, 1950	1,505	42	1,463	97·2
Turkey	1947–48	Brothels and registered	UN, 1950	2,239	—	2,239	100·0
United Kingdom	1954	Clandestine	Nicol, 1956	215	39	176	81·8
Italy	1947–48	Brothels	UN, 1952	4,000	"Almost all" Italians.		
Union of South Africa	—	Unauthorized brothels	UN, 1952	"Mostly" European and Coloured women of South African nationality.			
Trinidad and Tobago	—	—	UN, 1952	"Practically all" native-born.			

Hume, 1948). Prostitutes in Iraq "all belong to the necessitous classes of society" who have lost male economic support (United Nations Organization, 1950, 1953). In the Lebanon "many prostitutes are compelled by poverty and need to sell themselves in order to live" (UNO, 1953). With the improvement of social conditions (*e.g.* ofunemployment, poverty, and hunger) prostitution tends to wane (*e.g.*, in Czechoslovakia: UNO, 1952).

Prostitution flourished in the economic confusion of post-war Japan (UNO, 1952), after the partition of India (UNO, 1953), and during and after the Korean conflict (Graham, 1952).

Campbell (1946) and Lees (1946) writing of Italy, Curtis (1947) and Campbell (1946) writing of Germany, and Prebble (1946) writing of India, have all given eloquent testimony to the widespread prostitution to be found in war areas. Prebble described an interesting example of inverted prostitution among the Khasi women in the hills near Shillong, Assam, who were heavily infected with venereal disease. Desiring to become pregnant through intercourse with Europeans, they themselves offered monetary inducement to the troops stationed in the district.

SUPPLY AND DEMAND

The Committee on Social Affairs of the League of Nations (1938) considered that: "The primary causes must always be the demand for prostitutes—however created—and the public toleration of prostitution, both dependent on current philosophy, and on morality, habit, tradition, education, and the structure of society".

Figures quoted by the Association for Moral and Social Hygiene (1955) give an interesting example of the operation of the law of supply and demand from London. The annual number of charges for street solicitation in the Metropolitan Police District in the years 1935–1949 varied from 1,526 to 5,445—the peak occurring in 1949 when 1,268 women were involved. In 1951 (the year of the Festival of Britain) the number soared to 9,683, and in 1953 (Coronation year—which also attracted many visitors to the capital) 9,584 charges were made. Wailes (1945) noted an increase of prostitution in London during the war because of the presence of large numbers of troops, particularly American soldiers, with money to spend.

However, as Flexner (1919) and others have pointed out, the demand can be artificially boosted by the advertisement of the prostitute herself and by official endorsement by regulation. The efforts of social reformers have rightly been first aimed at reducing the demand created by the mere existence of prostitution itself.

THE PROSTITUANT

That more attention should be paid to the male component of prostitution, the prostituant, has been the plea of many writers (*e.g.* Hijmans, 1953). Prostitution supplies a demand: if there were no prostituants there would be no prostitutes. "It is certain that there can be found far more men seeking for sexual pleasure than women soliciting gain" (Association for Moral and Social Hygiene, 1955).

Sutherland (1950) stated that more information was required concerning the prostituant, for "unless something is done to re-educate or re-habilitate a venereal disease patient, it is very likely that upon his return to the community he will revert to his former way of life, become re-infected, and in due course return for treatment". The patient who has repeated attacks of venereal infection has frequently been used as a starting point of studies of the prostituant (*e.g.* Anderson, 1954). The emotional immaturity of promiscuous persons has often been stressed (*e.g.* Pincock, 1947).

French (1955), quoting James (1951), listed five types of men who comprise the demand:

(1) Young men and students in the experimental stage of development;
(2) Men sexually isolated, whether for a short or long time, such as soldiers and commercial travellers;
(3) Vicious persons;
(4) Married men with frigid or invalid wives;
(5) Men who have defective love objects, *e.g.* amongst others the pimp and the ponce.

Kinsey and others (1948) considered that men resort to prostitutes because they have insufficient sexual outlets in other directions, or because prostitution provides types of activity not so readily available elsewhere. Others do so because of a physical deformity such that only a prostitute will have intercourse with them. Others because they can pay for sexual relations and forget other responsibilities. Others because (taking the long-term view) it is cheaper to have intercourse with a prostitute than to court a girl for a long period.

There has thus in recent years been a welcome tendency for the other side of the prostitutional coin to be investigated. For example, Wyness (1953), describing VD social work in British Columbia, divided venereal disease patients into five groups:

(1) Capable of taking responsibility for himself, functioning adequately in his life situation. Infection acquired as an episode out of character with behaviour pattern.

(2) Capable of taking responsibility for himself, but needing help in defining this. He lacks knowledge about venereal disease and about sex behaviour in general.

(3) Manifesting real conflict in some area of his life. His promiscuous behaviour is symptomatic of this stress. The pressure may be external, because of the life situation in which he finds himself, or may occur within the personality structure of the individual.

(4) Functioning in all his personal relationships on a causal level, his sexual behaviour following the same pattern. His roots are shallow and he does not want or is incapable to assume personal responsibilities. His goal in life is ill-defined, but he is not in conflict about himself or his situation.

(5) Incapable of ordering his own life, his promiscuous behaviour being part of his way of living. He exists on the fringe of crime, and authority is his natural enemy.

Of 660 persons with venereal disease, 104 belonged to Group I, 163 to Group II, 148 to Group III, 208 to Group IV, and 37 to Group V. The relatively small proportion in Group V is probably due to the fact that many were involved in criminal charges and attended the gaol clinic rather than that discussed by the author. Whether such an approach will be productive, however, remains to be seen.

Wittkower (1948) studied the psychological aspects of military patients with venereal disease and concluded that there was "no magic formula to prevent the development of promiscuous propensities. As a long-term policy this is a matter of child guidance, sex education, and mental hygiene in general".

Moreover, the approach to the prostituant can promise only partial success. While attention is being directed more and more to the prostituant and the official attitude to prostitutes in almost all parts of the world has hardened, a new factor has emerged, that of the "good-time girl". She provides a greater problem than ever the prostitute did, for she has a far wider field of operations.

That the "good-time girl" is usually morally a prostitute has already been indicated, but few would dare to draw the line between the prostitute and normal woman-kind. The accurate focusing of the margin between the delinquent teenage girl and the normal spirited young woman is an ever-present difficulty to parents. The key to the problem of venereal disease is promiscuity, not whether money is or is not exchanged for intercourse. Successful

campaigns against promiscuity are infinitely more difficult to undertake than are those against prostitution.

The Risk of the Prostitute to the Individual

Lentino (1955), writing of brothels in Italy, reaffirmed the inadequacy of the attempted medical control of prostitutes, and stated that although the girls were examined every other day, 80 per cent. of all cases of venereal disease in American soldiers stationed in the district were contracted in houses of prostitution. He did not, however, state the individual risk per exposure, or the percentage of men for whom the brothel was the regular sexual outlet.

It must not be thought that intercourse with a prostitute in a brothel necessarily carries a high risk of infection. Campbell (1946) indicated that brothels with good medical control and ablution facilities gave rise to little venereal disease in war-time Algiers. Bettley (1949) described the experience of three brothels subject to medical control in an unspecified European country in war-time, where there were 277,482 users in 8 months. Of these, 248,593 (89 per cent.) used preventive ablution in a room set aside for the purpose, and during this period only 87 men contracted venereal disease and blamed the brothel as the source of infection. The incidence per 1,000 brothel-users who took prophylactic treatment was calculated as 0·31 per 1,000, but for those not taking treatment it was 0·723 per thousand. There was little difference in these groups regarding the incidence of gonorrhoea (0·08 and 0·09 per 1,000 respectively), but syphilis was more than four times as likely in those who used no preventive treatment.

In the Far East, where prostitutes as a whole are highly infected and precautions other than washing are seldom employed, the average individual may expose himself frequently with prostitutes without contracting venereal disease.

Ram (1950), writing of Singapore, where three-quarters of the prostitutes were infected with venereal disease, interviewed 194 male V.D. patients. Of these 19·5 per cent. exposed themselves on the average once a month, 29 per cent. twice a month, and 20·5 per cent. more than twice a month. Of 154 single men only 3 per cent. were infected after the first exposure and 15 per cent. in under ten exposures. Up to 100 exposures were achieved with impunity by 33 per cent. and up to forty exposures by 60 per cent. The average number of exposures before infection was 102.

It is evident that, for every individual who is so unfortunate as to contract venereal disease, a great many others apparently escape. A few of these, of course, are infected with syphilis without knowing it.

Alcohol, Prostitution, and Venereal Disease

The association of alcohol and venereal diseases has often been noted (*e.g.* in Ethiopia by Guthe (1949) and in Sweden by Tottie, 1950).

Tottie (1949) concluded from his series that, where cash payment was given, alcohol played the greatest role; prostitutes obviously seek their clientèle among persons under the influence of alcohol, when moral inhibitions are less valid and the fear of venereal infection disappears.

Wittkower and Cowan (1944), quoted by Dicks (1953), noted that 29·5 per cent. of 200 military men with venereal disease were heavy drinkers, 68·0 per cent. were moderate drinkers, and only 2·5 per cent. were teetotallers. Of 86 "controls" on the other hand, 2 per cent. were heavy drinkers, 91 per cent. were moderate drinkers, and 7 per cent. were teetotallers: 49 per cent. of the patients with venereal disease admitted intoxication at the time of infection and 7 per cent. were totally drunk.

Johns (1945) noted the association between alcohol and venereal disease on Tyneside in England; she postulated that for women the association of drink and sexual indulgence may be due to the relaxation of moral judgment, or else to the fact that the promiscuity provides the drink or the money to buy it.

In the gonorrhea study of the British Co-operative Clinical Group (1956), 76·7 per cent. of 2,254 male patients, but only 24·8 per cent. of 286 female patients, admitted drinking alcohol before intercourse. There is no doubt that the majority of male patients with venereal disease have taken alcohol before intercourse; this very fact leads to a smaller likelihood of taking any precautions, so that there is a greater possibility of infection in promiscuous drinkers than in promiscuous non-drinkers.

Ryan (1955) questioned 172 American enlisted men after 5 days in a modern Asian city. 70 per cent. had had intercourse. 88 per cent. had taken alcohol, but only 57 per cent. of the contacts were made after drinking, and 80 per cent. said that they would have had sexual intercourse whether they had been drinking or not. This is a significant observation. On the other hand the selling of alcohol in most countries does more or less directly encourage prostitution. Prostitution is used to encourage the sale of alcohol by the employment of girls, "waitresses", hostesses, singers, and the like in bars, restaurants, and night clubs. The truth probably is that men are less inhibited in seeking their sexual pleasures when

under the influence of alcohol; some even take it deliberately for this reason. Where alcohol is sold prostitutes tend to congregate to satisfy the demand.

Summary and Conclusions

(1) That the prostitute is but one factor in the spread of venereal disease is indicated. The prostituant, especially the itinerant male, is equally important. Evidence is given to show that itinerant males are more prone to venereal disease than non-itinerants, and that they frequently contract such diseases from prostitutes.

(2) The itinerant male usually contracts his disease from the static female. Figures are presented which indicate that over 90 per cent. of the inmates of brothels in many countries of the world are staffed by the nationals of the country in which the brothels are situated. The tendency is noted for more studies to be undertaken of the prostituant as opposed to the prostitute.

(3) Prostitution flourishes in situations of political and economic confusion and obeys the law of "supply and demand".

(4) The risk of an individual contracting venereal disease from a prostitute is considered. Some of the data presented indicate that the risk is lower than might be expected.

(5) The role of alcohol in the spread of venereal disease is discussed. The association is not necessarily so simple as it first appears, for the effect of alcohol on the causation of venereal diseases seems to be more indirect than direct. Alcohol may encourage prostitution and contrariwise prostitution may boost the sales of alcohol.

REFERENCES

Anderson, D. O. (1954). "A sociological analysis of the venereal disease repeater patient". Graduation thesis, Faculty of Medicine, University of British Columbia.

Association for Moral and Social Hygiene (1955). Evidence for the Departmental Committee of Enquiry.

Bettley, F. Ray (1949). *Brit. J. vener. Dis.*, **25,** 56.

British Co-operative Clinical Group (1956). *Ibid.*, **32,** 21.

Campbell, D. J. (1946). *Ibid.*, **22,** 158.

Curtis, F. R. (1947). *Ibid.*, **23,** 20.

Dicks, H. V. (1953). "Psychological Aspects of Promiscuity". Lecture at W.H.O. Port Demonstration Centre VD Course, Rotterdam.

Flexner, A. (1919). "Prostitution in Europe" (abridged edition). Grant Richards, London.

Freed, L. F. (1953). *S. Afr. med. J.*, **27,** 686.

French, E. (1955). *In* "Women of the Streets", ed. C. H. Rolph. British Social Biology Council, Committee on Prostitution. Secker and Warburg, London.

General Register Office (1952). Census 1951. Great Britain. One per cent Sample Tables. H.M.S.O., London.

Gjessing, H. C. (1956). *Brit. J. vener. Dis.*, **32,** 86.

Graham, R. S. (1952). *Amer. J. Syph.*, **36,** 433.

Gudmundsson, H. (1956). USPH Current Literature on Venereal Diseases, p. 120.

Guthe, T. (1949). *Bull. Wld Hlth Org.*, **2,** 85.

—— and Hume, J. C. (1948). "International Aspects of the Venereal Diseases Problem". *Amer. Soc. Hyg. Ass.*, New York.

Häro, A. S., and Pätiälä, R. (1954). *Ann. med. exp. Biol. Fenn.*, **32,** Suppl. 10.

Hermans, E. H. (1954). *Int. med. Abstr.*, **16,** 57 (Calcutta).

Hijmans, A. (1953). "Prostitution, Promiscuity and Prophylaxis". Paper presented at W.H.O. Port Demonstration Centre VD Course.

Holmes, W. (1955). *Med. J. Malaya*, **10,** 178.

James, T. E. (1951). "Prostitution and the Law". Heinemann, London.

Johns, H. M. (1945). *Brit. J. vener. Dis.*, **21,** 17.

Kinsey, A. C. Pomeroy, W. B., and Martin, C. E. (1948). "Sexual Behaviour in the Human Male". Saunders, London.

Lees, R. (1946). *Brit. J. vener. Dis.*, **22,** 149.

Lentino, W. (1955). *J. Amer. med. Ass.*, **158,** 20.

Lozano, A. A. (1951). *J. Philipp. med. Ass.*, **27,** 171.

Nicol, C. S. (1956). *Brit. J. vener. Dis.*, **32,** 27.

Pereira, E. D. C. (1956). Personal communication.

Pincock, T. A. (1947). Proc. Fourth Western Canada Venereal Disease Control Conference, pp. 67–70.

Prebble, E. E. (1946). *Brit. J. vener. Dis.*, **22,** 55.

Ram, L. M. (1950). *Proc. Alumni Ass. Malaya*, **3,** 285.

Ryan, R. F. (1955). *Hum. Biol.*, **27,** 32.

Shepard, A. C., and Page, W. J., Jr. (1954). *Publ. Hlth Rep. (Wash.)*, **69,** 831.

Stuart, J., and Joyce, G. (1954). *Ibid.*, **69,** 1197.

Sutherland, R. (1950). *Brit. J. vener. Dis.*, **26,** 1.

Tottie, M. (1949). *Svenska Läk., Tidn.*, **46,** 211.

—— (1950). *Acta derm.-venereol. (Stockh.)*, **30,** 450.

United Nations Organisation (1948). Economic and Social Council. Traffic in Women and Children. Summary of Annual Reports for 1946–1947, Lake Success, New York.

—— (1950). *Ibid.* Addendum to Summary of Annual Reports for 1947–1948, New York.

—— (1952). *Ibid.* Summary of Annual Reports for the Period 1948–1950, New York.

—— (1953). *Ibid.* Addendum to the Summary of Annual Reports for the Period 1948–1950, New York.

United States Navy (1954). Statistics of Navy Medicine: Fiscal Year 1954, **10,** 3.

Wailes, M. A. (1945). *Brit. J. vener. Dis.*, **21,** 15.

Willcox, R. R. (1954). *J. roy. Nav. med. Serv.*, **40,** 187.

—— (1957). "The Role of Prostitution in the Spread of Venereal Diseases". W.H.O. Working Document INT/VDT/89. *Int. Rev. Criminal Policy*, in press.

—— (1960). *Med. Press*, **244,** 521.

—— (1961). *Brit. J. vener. Dis.*, **37,** in the press.

Wittkower, E. D. (1948). *Ibid.*, **24,** 59.

—— and Cowan, J. (1944). *Psychosom. Med.*, **6,** 287.

Wyness, E. S. (1953). "Public Welfare in British Columbia, 1953", pp. 100-101. Annual Report of The Social Welfare Branch of the Department of Health and Welfare for the year ended March 31, 1953. Victoria, B.C.

Corrigenda

Stein, Z., and Susser, M. W. (1960). *Brit. J. prev. soc. Med.*, vol. 14.

p. 85, col. 2, last line: *add* "Deviant families were intermediate".

p. 87, col. 1, line 18: *for* "as judged . . . with the law", *read* " . . . , as judged by dwelling place, admissions to institutions, and employment, though not by contact with the law, . . . "